The American School and University

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

1939

ELEVENTH ANNUAL EDITION

COPYRIGHT, 1939

AMERICAN SCHOOL PUBLISHING CORPORATION

470 FOURTH AVENUE, NEW YORK

Foreword

By HAROLD L. ICKES

Secretary of the Interior; Administrator, Federal Emergency Administration of Public Works; Chairman, National Resources Committee

LOOKING over this volume, I am impressed with the splendid technical achievements and breadth of view of our educators. Here, indeed, is a field of activity that is full of hope, an area of genuine progress and enlightenment. I am particularly pleased to observe the advances made in the general field of education, whether technical or intellectual, because PWA, of which I am Administrator, has long been an active school builder. Speaking in the name of the Public Works Administration, I may say—with a pride that is perhaps not unpardonable—that within the short space of a half-dozen years we made possible the construction of more educational buildings than was ever done in recorded history in the same period of time. The historian of the future will probably consider this among the most fruitful achievements of the Roosevelt Administration.

BETWEEN 1933 and 1938 PWA helped finance 7,290 school buildings of various and varied types, from auditoriums and gymnasia to laboratories and cafeterias. We expended almost half a billion dollars on these educational structures, the total cost of which, as supplemented by the various municipalities, ran well over the billion dollar mark. In fact, more than 40 per cent of the non-Federal PWA money went into our national schools.

THIS last year the percentage allotted to educational buildings has been even higher. Under the PWA program begun in 1938 we are building no less than 237 structures for the use of colleges in 34 states, as well as in Hawaii and Alaska. These buildings range from dormitories and hospitals to heating plants and greenhouses.

IT has been President Roosevelt's and my dream that America's youth should have all the educational facilities and opportunities worthy of a great democracy. We are proud of the fact that one-half of the nation's boys and girls of high-school age are in high school; but we should be prouder still if all our youth had the opportunity for advanced study. It is, I know, a time-worn phrase but nevertheless an eternal truth that knowledge is light, and a progressive democracy can not have too much light. The money that goes into education is like seed in rich soil. And books like this one, books that help in the intelligent planning of our educational system, should reach every educator and public-spirited citizen.

Harold L. Ickes

Editorial Board of Advisors

CHARLES D. ANDERSON
Assistant Commissioner in Charge of Business Affairs, Department of Public Instruction, State of New Jersey
Trenton, N. J.

C. J. ANDERSON
Dean, School of Education, University of Wisconsin
Madison, Wis.

DR. HOMER W. ANDERSON
Superintendent of Schools
Omaha, Nebr.

DR. J. E. BUTTERWORTH
Director, Graduate School of Education, Cornell University
Ithaca, N. Y.

JAMES E. CUMMINGS
Assistant Director, Department of Education, National Catholic Welfare Conference
Washington, D. C.

W. S. DEFFENBAUGH
Chief, Division of American School Systems, U. S. Office of Education
Washington, D. C.

JOHN J. DONOVAN
Architect
Berkeley, Calif.

DR. BOYD EDWARDS
Headmaster, The Mercersburg Academy
Mercersburg, Pa.

DR. FRED ENGELHARDT
President, University of New Hampshire
Durham, N. H.

DR. WILLIAM P. FEW
President, Duke University
Durham, N. C.

DR. WILLARD S. FORD
Superintendent of Schools
Glendale, Calif.

DR. JOHN GUY FOWLKES
Professor of Education, University of Wisconsin
Madison, Wis.

GEORGE S. FRANK
Manager of Purchases, Cornell University
Ithaca, N. Y.

RALPH EVANS HACKER
Hacker & Hacker, Architects
Fort Lee, N. J.

DR. RAY L. HAMON
Professor of School Administration, George Peabody College for Teachers
Nashville, Tenn.

WALLACE K. HARRISON
Harrison & Fouilhoux, Architects
New York, N. Y.

DR. F. W. HART
Professor of Education, University of California
Berkeley, Calif.

DR. F. E. HENZLIK
Dean, Teachers College, University of Nebraska
Lincoln, Nebr.

DR. WILLIAM H. HOLMES
Superintendent of Schools
Mt. Vernon, N. Y.

DR. HAMILTON HOLT
President, Rollins College
Winter Park, Fla.

DR. T. C. HOLY
Bureau of Educational Research, Ohio State University
Columbus, Ohio

THEODORE M. JOHNSON
Supervisor of Purchases, New York University
New York City

SAMUEL D. JONES
Business Director, Board of Education
Louisville, Ky.

DR. CHARLES A. LEE
Professor of Education and Director of Educational Service, Washington University
St. Louis, Mo.

DR. H. H. LINN
Superintendent of Buildings and Grounds, Teachers College, Columbia University
New York City

WILLIAM ORR LUDLOW
Ludlow & Ludlow, Architects
Summit, N. J.

DR. HENRY NOBLE MACCRACKEN
President, Vassar College
Poughkeepsie, N. Y.

REGINALD E. MARSH
Tooker & Marsh, Architects
New York City

J. W. MCCLINTON
Executive Secretary, National School Supplies & Equipment Association
Chicago, Ill.

DR. HUBERT L. MILLS
Business Manager, Houston Independent School District
Houston, Texas

DR. E. E. OBERHOLTZER
Superintendent of Schools and President, University of Houston
Houston, Texas

DWIGHT H. PERKINS
Architect
Evanston, Ill.

HENRY G. PERRING
Architect and Engineer
Baltimore, Md.

DR. LEWIS PERRY
Principal, Phillips Exeter Academy
Exeter, N. H.

DR. W. C. REAVIS
Professor of Education, University of Chicago
Chicago, Ill.

JAS. GAMBLE ROGERS
Architect
New York City

REV. AUSTIN G. SCHMIDT
Professor of Education, Loyola University
Chicago, Ill.

REV. SYLVESTER B. SCHMITZ
Dean, St. Benedict's College
Atchison, Kans.

DR. JOHN A. SEXSON
Superintendent of Schools
Pasadena, Calif.

ARTHUR A. SHURCLIFF
Fellow, The American Society of Landscape Architects
Boston, Mass.

ERNEST SIBLEY
Architect
Litchfield, Conn.

DR. ALEXANDER J. STODDARD
Superintendent of Schools
Denver, Colo.

DR. GEORGE D. STRAYER
Professor of Education and Director, Division of Field Studies, Teachers College, Columbia University
New York City

DR. J. W. STUDEBAKER
Commissioner of Education, Office of Education, U. S. Department of the Interior
Washington, D. C.

Publishers

AMERICAN SCHOOL PUBLISHING CORPORATION, NEW YORK

HAROLD S. BUTTENHEIM, Editor
N. L. ENGELHARDT, Consulting Editor
MARTHA E. BUTTENHEIM, Managing Editor
M. V. FULLER, Associate Editor

EDGAR J. BUTTENHEIM, President
PRENTICE C. FORD, Vice-President

Table of Contents

PAGE

FOREWORD 5

EDITORIAL BOARD OF ADVISORS 6

INDEX TO SUBJECTS 10

INDEX TO AUTHORS 12

I. The Building Program

POPULATION TRENDS AND THE SCHOOL-BUILDING PROGRAM 13
By William G. Carr, Secretary, Educational Policies Commission; Director, Research Division, National Education Association

RE-THINKING THE FUNDAMENTALS OF SCHOOL-PLANT PLANNING 19
By N. L. Engelhardt, Professor of Education, Teachers College, Columbia University

II. Design and Construction of Buildings

THE PLANNING AND MAINTENANCE OF RURAL SCHOOLS 24
By Charles Bursch, Chief, and Doyt Early, Architect, Division of Schoolhouse Planning, California State Deaprtment of Education

THE CONTRIBUTION OF COLOR TO EDUCATIONAL ENVIRONMENT 31
By Warren S. Holmes, Architect, Lansing, Mich.

HEATING EDUCATIONAL BUILDINGS 37
By Samuel R. Lewis, Consulting Engineer, Chicago, Ill.

CLASSROOM SKYLIGHTING 42
By Ray L. Hamon, Professor of School Administration, and Robert F. Kunkel, George Peabody College for Teachers

PLUMBING REQUIREMENTS OF EDUCATIONAL INSTITUTIONS 46
By Chester A. Slocum, Consulting Engineer, Slocum & Fuller, New York City

AN ANNOTATED BIBLIOGRAPHY ON SCHOOL AND COLLEGE BUILDINGS 52
By Stanton Leggett, Advanced School Scholar, Teachers College, Columbia University

III. Architects for Educational Buildings 156

IV. Operation and Maintenance

THE ORGANIZATION FOR MAINTENANCE IN A MEDIUM-SIZE SCHOOL SYSTEM 166
By Ben B. Herr, Assistant Superintendent in Charge of Business Affairs, Lexington, Ky.

SCHOOL PLANT INSPECTION 171
By C. L. Crawford, Assistant Superintendent in Charge of Business, The Public Schools of the City of Muskegon, Muskegon, Mich.

ADEQUATE SCHOOL MAINTENANCE 174
By S. C. Joyner, Assistant to Business Manager, Los Angeles City Schools, Los Angeles, Calif.

V. Landscape Design and Development

PRINCIPLES GOVERNING THE LANDSCAPE DEVELOPMENT OF GROUNDS FOR EDUCATIONAL INSTITUTIONS . 203
By Chance S. Hill, Landscape Architect, Downers Grove, Ill.; and Albert D. Taylor, Landscape Architect, Cleveland, Ohio

LANDSCAPE ARCHITECTS FOR UNIVERSITY AND SCHOOL PROJECTS 216

PAGE

VI. Physical Education and Athletics

A Well-Balanced Physical Education Program Should Provide for Winter Sports Trends . . 235
By Harold M. Gore, Head, Department of Physical Education for Men, Massachusetts State College

The Design and Construction of Toboggan Chutes 240
By Samuel P. Snow, Landscape Architect

Downhill Ski Trails 244
By Robert W. Vincent, Institutional Fellow, Department of Physical Education for Men, Massachusetts State College

The Construction of Ski Jumps 248
By Lawrence E. Briggs, Assistant Professor of Physical Education, Massachusetts State College; Chairman, Junior Committee, National Ski Association

Design and Construction of Ski Tows 254
By Paul S. Putnam, Landscape Architect, Greenfield, Mass.

Ice Sports at Schools and Colleges 259
By Russell L. Snow, Boys' Supervisor, Leake and Watts Home School, Yonkers, N. Y.

Ski Shelters and Lodges 265
By Walter Kimball Mitchell, Jr., Landscape Architect, Newton Highlands, Mass.

VII. Classroom—Library—Auditorium

Better Planning for College Classrooms 288
By W. K. Harrison, Harrison & Fouilhoux, Architects

Classroom and Equipment Requirements for the New Social Studies. 292
By J. W. Baldwin, The University of Texas

Design and Equipment of Consolidated School Libraries 297
By Mrs. Mary Peacock Douglas, School Library Adviser, State of North Carolina

The Planning of the School Stage 304
By George W. Ebey, Director of Dramatics, Kamehameha Schools, Honolulu, Hawaii

Better Film Distribution through Organization 312
By Charles F. Hoban, Jr., Director, Motion Picture Project, American Council on Education

VIII. Commercial Department—Administrative Office

Modernizing Child Accounting Records 343
By John Guy Fowlkes, University of Wisconsin

The Organization of a High-School Commercial Department 351
By John N. Given, Supervisor, Commercial Education Section, Los Angeles City Schools

The Selection of Equipment for Business Education 353
By Herbert A. Tonne, Associate Professor of Education, New York University; Editor, *Journal of Business Education*

IX. Cafeteria—Home Economics—Dormitory

How Proper Building Design and Equipment Can Lessen the Problems of Residence Hall Managers 409
By Melissa Hunter, Director of Dormitories, and Head of Institution Economics, School of Home Economics, Oregon State College

Planning Kitchens for Residence Halls 413
By Margaret E. Terrell, Director, Dining Halls and Residences, University of Washington

The Centralized Cafeteria Department of the Cleveland Heights School System. 419
By Mary Farnam, Director of Cafeterias, Cleveland Heights Board of Education, Cleveland Heights, Ohio

Home Economics in a Progressive School 424
By Jane Winter Lighter, Head, Home Economics Department, New Trier Township High School, Winnetka, Illinois

PAGE

X. Laboratory Design and Equipment

SERVICING A MODERN LABORATORY—III 465
By W. B. Foulk, Curator, Frick Chemical Laboratory, Princeton University

MAINTENANCE OF LIVING MATERIAL IN THE BIOLOGICAL LABORATORY 480
By Julian D. Corrington, Professor of Biology, Washington College, Chestertown, Md.; Editor, Microscope Department, *Nature Magazine*

XI. Shop Planning and Equipment

PLANNING AND EQUIPPING INDUSTRIAL ARTS LABORATORIES 508
By Willis A. Whitehead, Member of the Summer Session Staff, The Ohio State University; and Supervisor of Planning and Drawing, High School, Newark, Ohio

XII. Transportation Service

PROBLEMS INVOLVED IN PROVIDING EFFICIENT SCHOOL TRANSPORTATION SERVICE 539
By Edgar L. Morphet, Director of Administration and Finance, State Department of Public Instruction, Tallahassee, Fla.

XIII. College, University and Normal School Presidents 554

XIV. Presidents of Junior Colleges 562

XV. Heads of Private Schools 566

XVI. Superintendents of Schools in Places of 5,000 Population and Over 571

XVII. Superintendents of Catholic Parochial Schools 579

XVIII. Aids Available to Local School Boards from State Departments 581

XIX. Classified Index to Manufacturers' Products and Services 587

INDEX TO ADVERTISERS 606

Index to Editorial Subjects

This index covers only the present volume, XI (1939). A cumulative index to the previous volumes, I through X, was published in Volume X.

A

Accounting, Child—343
Adaptability [See Flexibility]
Administrative Office [See Office]
Adults, Provisions for—17, 19
Advertisers, Alphabetical List of—606
Advertisers, Classified Index to Products—587
Air-Conditioning Systems—37
Air View, Combined Elementary and High School Development—213
Air Views, Colleges and Universities—209, 213
Air Views, High Schools—23, 209, 213
Apparatus, Laboratory [See Laboratory]
Aquaria—481
Association of School Film Libraries, Inc.—312
Athletic Facilities [See Physical Education; Winter Sports Facilities]
Auditoriums—304 [See also Stage]

B

Bibliography, Annotated, on School and College Buildings—52
Bibliography on Commercial Education Facilities—358
Bibliography on Industrial Arts Laboratory Planning and Equipment—518
Bibliography on Maintenance of Living Material in Biological Laboratories—485
Bibliography on Ski-Jump Construction—252
Bibliography on Ski-Tow Construction—258
Bibliography on Toboggan-Chute Construction—243
Billing-Machine Classroom—354 [See also Commercial Classrooms]
Biology Laboratories—480 [See also Laboratory]
Bookcases and Bookshelves—299
Bookkeeping Classrooms—354, 355 [See also Commercial Classrooms]
Books on Building and Equipment [See Bibliography]
Building Programs [See Planning]
Business Training [See Commercial Education]
Bus Drivers—546
Bus Routes—544
Bus Standards—540

C

Cafeteria, Organization of Centralized Department—419
Cages, Animal—483
Campus Development and Upkeep—203 [See also Grounds]
Chemicals, Purchase of—472
Chemistry Laboratories—465 [See also Laboratory]
Child-Accounting Records—343
City Planning and School Planning—21
Classroom for Economic Geography—358
Classrooms, College—288
Classrooms for Commercial Education [See Commercial Classrooms]
Classrooms for Home Economics Education [See Home Economics Classrooms]
Classrooms for Social Studies—292
Classrooms, Kindergarten—33
Cleaning, Vacuum—51
Cleveland Heights, Ohio, Centralized Cafeteria Department—419
Clothing Laboratory—424
College and University Facilities—18, 208, 236, 288, 409, 413, 465 [See also Air Views; Floor Plans; Grounds Plans]
Color in Building—31, 298
Commercial Classrooms and Departments—351, 353
Community Use of School Plant—17, 19, 25
Consolidated-School Libraries—297
Consolidation of Schools—24
Costs, Heating and Ventilating—40
Cultures, Biological—484
Curriculum, Changing—17, 21, 288
Custodial Service—167

D

Dartmouth College, Ice-Hockey Rink—262
Depreciation—174
Dining Facilities—412 [See also Cafeterias]
Domestic Science [See Home Economics]
Dormitory Design and Equipment—409, 413
Dormitory Management—409
Downer's Grove, Ill., Community High School Development—205, 206
Drainage of Grounds—214
Dramatic Facilities [See Stage]
Drinking Fountains—47
Drivers, Bus—546
Driveways—215
Duplicating-Machine Classroom—355 [See also Commercial Classrooms]

E

Eating Rooms [See Cafeterias; Dining Halls]
Economic-Geography Classroom—358
Elementary-School Facilities—17, 31, 204 [See also Air Views; Floor Plans; Grounds Plans]
Enrolment Trends—16, 19
Entrances and Entrance Halls—32
Equipment, Classified Index to Manufacturers of—587
Equipment, List of Manufacturers of—606

F

Filing-Practice Classroom—355 [See also Commercial Classrooms]
Filing Systems—346, 465
Film Libraries, Association of—312
Films, Sources of—312
Fire Protection—51
Flexibility and Adaptability—26
Floor Maintenance—168
Floor Materials—509
Floor Plans, College—289
Floor Plans, Combined Elementary and High School—27
Floor Plans, Elementary School—27, 28, 29, 30
Floor Plans, High School—354, 355, 356, 358, 424, 514, 515, 516, 517
Floor Plans, Junior High School—39, 293
Floor Plans, Rural School—26
Food Service, in Dormitories—412, 413
Food Service, in School Cafeterias—420
Foods Laboratory—424
Form for Transportation-Route Survey—545
Forms for Cafeteria-Department Records—420
Forms for Child-Accounting Records—346
Forms for Data on School Districts—347, 349
Forms for Data on Teaching Personnel—344, 346
Forms for Quotations on Laboratory Apparatus—469, 470
Foyer—32
Furniture, Library—302

G

Geography, Economic, Classroom for—358
Glassware, Laboratory [See Laboratory]
Grade Schools [See Elementary Schools]
Grading of Grounds—214
Grammar Schools [See Elementary Schools]

Grounds, Landscaping of [See Landscape Design and Construction]
Grounds Plans, College and University—208, 210, 211
Grounds Plans, Elementary School—27
Grounds Plans, High School—22, 204, 205
Grounds Plans, Teachers College—210

H

Handicapped Children, Provisions for—20
Heating Systems—37
Higher Education [See College and University]
High-School Facilities—17, 205, 206, 351, 353, 424 [See also Air Views; Floor Plans; Grounds Plans]
Home Economics Classrooms and Department—424
Homemaking [See Home Economics]
Household Management [See Home Economics]

I

Ice-Skating Facilities—235, 259
Illumination [See Lighting]
Independent Schools [See Private Schools]
Industrial Arts Laboratories—508 [See also Shop]
Inspection, as part of Operation and Maintenance Program—171, 175
Interior Decorating—31
Inventory in School Cafeteria—420
Irrigation of Grounds—215

J

Janitorial Service [See Custodial Service]
Junior Colleges—17
Junior-High-School Facilities—292 [See also Air Views; Floor Plans; Grounds Plans]

K

Kindergarten Planning—33
Kitchens in Dormitories—413
Kitchens in Home Economics Departments—425

L

Laboratory Apparatus and Supplies, Acquisition and Care of—465
Laboratory, Biological, Care of Living Material in—480
Laboratory, Industrial Arts—508
Laboratory Planning and Equipment—289, 465
Laboratory Servicing—465
Laboratory, Social Studies—294
Laboratory Storage Rooms—478
Landscape Design and Construction—203
Language Room—291
Lansing, Mich., Thomas Street School—31
Laundry of Laboratory Glassware—476
Lavatories—47
Lecture Room—290
Lexington, Ky., Maintenance Organization—166
Library Planning, for Consolidated Schools—297
Lighting, by Skylight—42
Lighting, Stage—307
Living Rooms—410
Location of Educational Buildings [See Site Selection]
Lockers—169
Los Angeles, Calif., Maintenance Program—174
Lunch Rooms [See Cafeterias]

M

Maintenance of Buildings and Grounds—24, 171, 174
Maintenance Organization in a Medium-Size School System—166
Manual Training [See Industrial Arts; Vocational Education]
Manufacturers, Alphabetical and Classified Lists of—587, 606
Mathematics Suite—289
Menu Planning—421
Motion Pictures, Films Available—312
Multiple-Use Equipment—26

N

Natural Lighting [See Lighting]
Neighborhood Planning and School Planning—20

O

Office-Practice Classrooms—354 [See also Commercial Education]
Office, Principal's—36
Operating Statement, Monthly, for School Cafeteria—423
Operation and Maintenance—166, 171, 174

P

Penmanship Classroom—357
Personnel [See Custodial Service; Teachers]
Physical-Education Facilities—235, 240, 244, 248, 254, 259, 265
Piping, Gas—50
Piping, Water—50
Planning Building Programs—13, 19, 24
Planning, Coordination of City and School System—21
Plot Plans [See Grounds Plans]
Plumbing—46, 410
Population Trends—13, 19
Preparatory Schools [See High Schools; Private Schools]
Primary Schools [See Elementary Schools]
Princeton University, Frick Chemical Laboratory—465
Principal's Office—36
Private-School Facilities—237
Programs for School Building and Site Selection [See Planning]
Project Room—291
Publications on Building and Equipment [See Bibliography]
Public-School Facilities—237 [See also High School; Elementary School]
Purchasing for Cafeteria Department—420
Purchasing Laboratory Apparatus and Supplies—465

R

Recitation Rooms [See Classrooms]
Record Systems for Child Accounting—343
Records for Cafeteria Department—422
Reconditioning and Remodeling—169
Recreation Facilities—235, 240, 244, 248, 254, 259, 265
Repair Department—167
Residence Halls [See Dormitories]
Rinks, Ice-Skating—259
Roads—215
Routes, Bus—544
Rural Schools—17, 24

S

Salvaging Materials and Equipment—169, 178
Science Laboratories—[See Laboratory]
Secondary Schools [See High Schools; Junior High Schools]
Seminar Room—291
Servicing Laboratories—465
Sewing Room—424
Shelving, Library—299
Shop Layouts and Equipment—508
Shower Facilities—47
Sinks—47
Site Selection—204
Skating, Ice [See Ice Skating]
Ski Jumps, Construction of—248
Ski Shelters and Lodges—265
Ski Tows, Construction of—254
Ski Trails, Construction of—238, 244
Skylighting—42
Snow Sports [See Winter Sports]
Social-Studies Classrooms—292
Stage Design and Equipment—304
Stairwell—33
Standards for Transportation Service—540, 549
State Responsibility for Transportation Service—548
Student-Forum Unit—289
Student Records [See Child Accounting]

T

Teachers, Records on—344, 346
Temperature Control—37
Terraria—483
Texas, University of, University Junior High School—292
Theaters—309 [See also Stage]
Toboggan Chutes, Construction and Care of—240
Toilet Facilities—46

Transportation Service—539
Typing Classrooms—356 [See also Commercial Education]

U

United States Military Academy, Ice-Skating Rink—262
Universities [See Colleges]
Upkeep [See Maintenance]
Urinals—47

V

Vacuum-Cleaning System—51
Ventilating Systems—37
Ventilation, Toilet-Room—46
Visual-Education Facilities—312

W

Walks—215
Water Closets—47
Water Supply—47
West Point, N. Y., Ice-Skating Rink at United States Military Academy—262
Winnetka, Ill., Home Economics Department of New Trier Township High School—424
Winter Sports Facilities—235, 240, 244, 248, 254, 259, 265
Winter Sports, Place of in Physical-Education Program—236

Index to Authors

This index covers only the present volume, XI (1939). A cumulative index to authors in volumes I through X was published in Volume X.

Baldwin, J. W.—292
Briggs, Lawrence E.—248
Bursch, Charles—24

Carr, William G.—13
Corrington, Julian D.—480
Crawford, C. L.—171

Douglas, Mary Peacock—297

Early, Doyt—24
Ebey, George W.—304
Engelhardt, N. L.—19

Farnam, Mary—419
Foulk, W. B.—465
Fowlkes, John Guy—343

Given, John N.—351
Gore, Harold M.—235

Hamon, Ray L.—42
Harrison, Wallace K.—288
Herr, Ben B.—166
Hill, Chance S.—203
Hoban, Charles F., Jr.—312
Holmes, Warren S.—31
Hunter, Melissa—409

Ickes, Harold L.—5

Joyner, S. C.—174

Kunkel, Robert F.—42

Leggett, Stanton—52
Lewis, Samuel R.—37
Lighter, Jane Winter—424

Mitchell, Walter Kimball, Jr.—265
Morphet, Edgar L.—539

Putnam, Paul S.—254

Slocum, Chester A.—46
Snow, Russell L.—259
Snow, Samuel P.—240

Taylor, Albert D.—203
Terrell, Margaret E.—413
Tonne, Herbert A.—353

Vincent, Robert—244

Whitehead, Willis A.—508

SECTION I
THE BUILDING PROGRAM

POPULATION TRENDS AND THE SCHOOL-BUILDING PROGRAM

By WILLIAM G. CARR

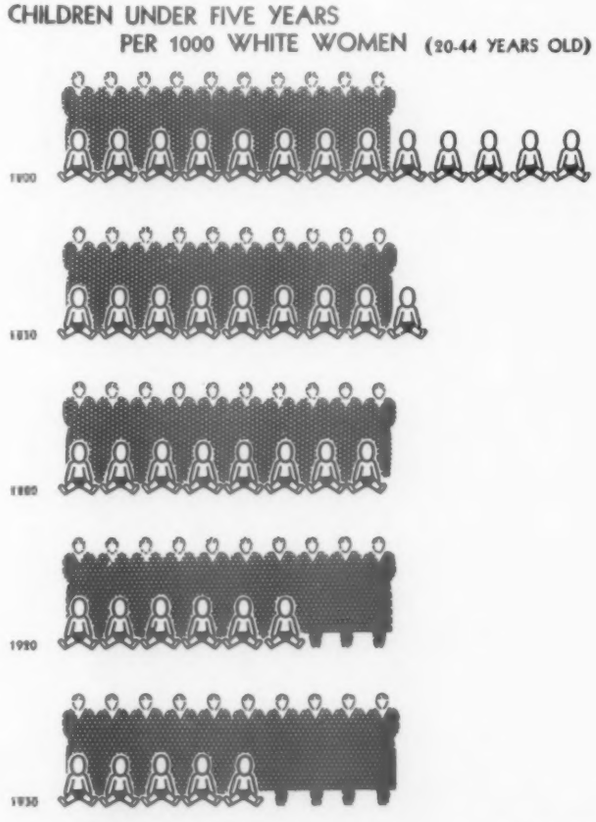
Secretary, Educational Policies Commission; Director, Research Division, National Education Association

CERTAIN population trends now developing in this country have important implications for the planning of educational buildings. Three major trends are outlined here in such a way as to reveal their effects on the school population and the school program—controlling factors in school-building construction.[1]

Growth of the Population

The first important trend is away from the rapid population growth of earlier decades and toward a stationary or possibly even a decreasing population within relatively few years. Up to 1860 the country had gained approximately one-third in numbers each succeeding decade; during the next half-century the rate dropped to one-fourth, and from 1910 to 1930 to approximately one-sixth increase over each preceding decade. It is estimated that during the present decade the aggregate increase will be less than one-twelfth more than that necessary to maintain a stable population. The country is still growing in terms of population, but the rate of growth is being lowered to such a degree that some estimates indicate a stationary or a decreasing population as early as 1980.[2]

The downward trend of the birth rate has been largely responsible for the decline in population growth. Virtual cessation of immigration since 1924 has also been a factor, but not nearly as important in the total picture as the falling birth rate. Since 1800, crude birth rates have decreased by about 85 per cent; even in the fifty years 1880 to 1930 the rates dropped 50 per cent, and estimates indicate that still another sharp drop is taking place during the present decade. Fertility rates for women of child-bearing age have dropped in both urban and rural areas, but to a much larger extent in the former. Later marriages, employment of women and increased living costs are important sociological reasons for fewer births, particularly in cities.



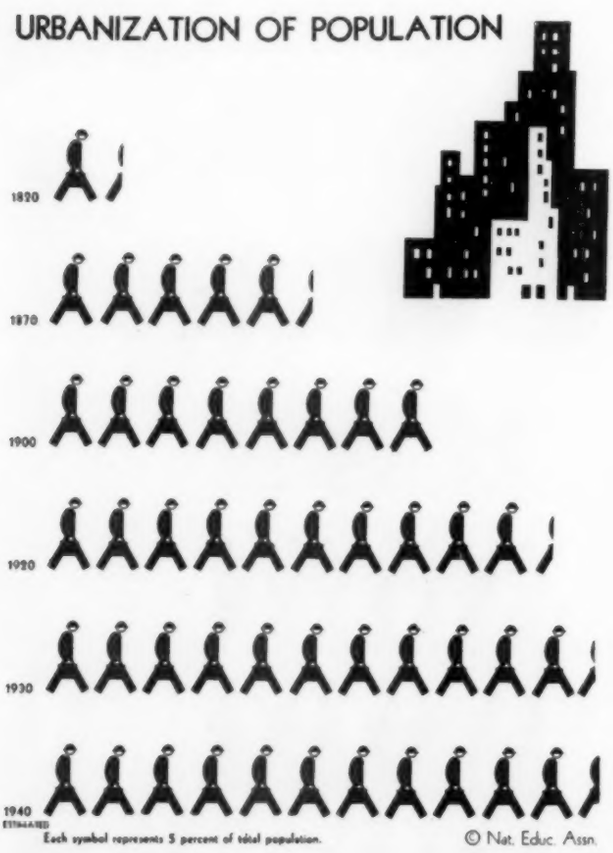
[1] National Education Association and American Association of School Administrators, Educational Policies Commission, Washington, D. C.: "The Effect of Population Changes on American Education." 1938. 58 pp. (Also published as National Education Association *Research Bulletin* for January, 1938.)

[2] From estimates of future population prepared for the report of the Committee on Population Problems to the National Resources Committee by W. S. Thompson and P. K. Whelpton, of the Scripps Foundation for Research in Population Problems.

Crude death rates have been materially lowered owing to improved care of infants at birth and thereafter, as well as generally better medical care for the whole population. Life expectancy at birth increased nine years during the interval from 1920-35, and still further extensions are anticipated. Although death rates are now going down, it is expected that, as the median age of the population approaches average life expectancy, the rates will again rise somewhat. This further narrowing of the margin between births and deaths may mark the beginning of an actually decreasing population.

It seems apparent that rural areas are to be the reservoirs of future population. Not only are fertility rates higher than in cities, but the death rates are somewhat lower. Some 55 per cent of the natural increase comes from the Southeast, Southwest, and Northwest, predominantly rural areas which contain about one-third of the total population. The remaining 45 per cent of natural increase comes from the Northeast, Middle States, and Far West, which are urban industrial regions containing two-thirds of the total population.[3] In general, the bulk of natural increase is coming at the present time not from those groups of society which are able to offer a superior opportunity to children for health care and education, but rather from the lower social-economic groups which maintain at the present time a relatively meager standard of living.

[3] For classifications of regions as used here, see Odum, Howard W.: "Southern Regions of the United States." University of North Carolina Press, Chapel Hill, N. C. 1936.



Internal Movement of the Population From Farms to Cities

The second important trend is the general movement of the population away from farms. The 1930 U. S. Census showed that the proportion of the population in cities was double that of fifty years before. The depression had the effect of restricting this migration somewhat but, contrary to popular opinion, it did not bring about any very extensive movement back to the farm. According to estimates of the Bureau of Agricultural Economics, fewer persons migrated from cities to farms during 1930-34 than during 1925-29.

Throughout the entire history of the country, prevailing migratory trends have ever been toward the West. The closing episode of this frontier expansion occurred during the late war when thousands moved into the Great Plains area to raise wheat for war needs. Today this once fertile land has been seriously reduced in its fertility, and hundreds of families are moving on toward the industrial cities of the Northeast, Great Lakes states, and Far West. The Southeastern states are also giving up great numbers of their population to the same industrial areas. The trend has gone so far that estimates for 1936 indicate the first actual decrease of farm population; this has occurred in spite of relatively high birth rates among agricultural people. The frequent poverty and unattractiveness of farm life are overbalanced by prospects of obtaining industrial employment or work relief and by the apparent security of city life.

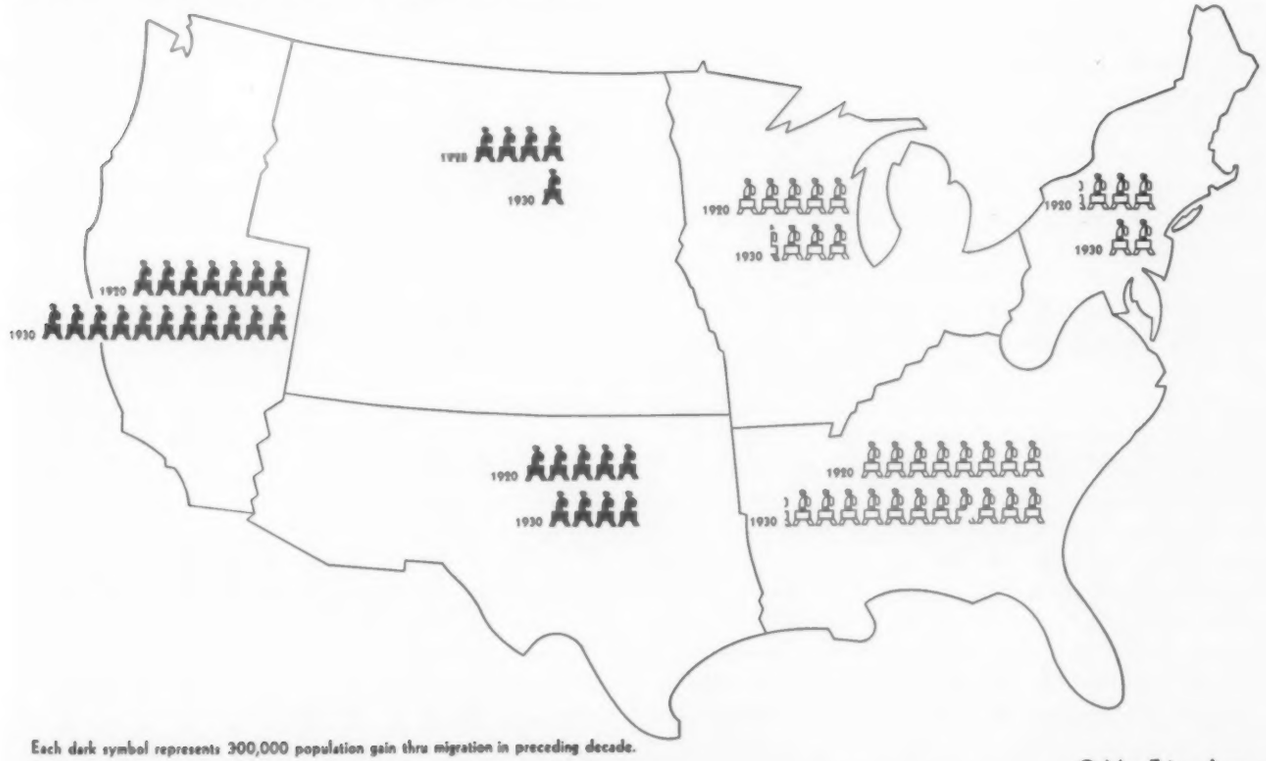
Although the trend toward the cities has been going on for many years, there are still large rural areas that are heavily overpopulated. One of these is the Old Cotton Belt of the deep South where, we are told by experts in agriculture and population statistics, there are several million persons who should be moved to other places in order to relieve the pressure on depleted natural resources. Other areas with similar problems of less intensity are the Southern Appalachian region, the cut-over areas of Michigan, Wisconsin, and Minnesota, and the Great Plains area extending from the Dakotas and Montana south to Texas. The net migration from farms during the 1920's is estimated at 6,300,000 persons, 60 per cent of whom were from the South. One-half of these Southern migrants were estimated to be youth under 18 years of age. In only one year (1932) do the estimates indicate a greater flow of population to farms than to the cities.

PROPORTION OF TOTAL POPULATION AND TOTAL NATURAL INCREASE BY REGIONS, 1936

Each man represents about 2 percent of total population.
Each child represents about 2 percent of total natural increase.

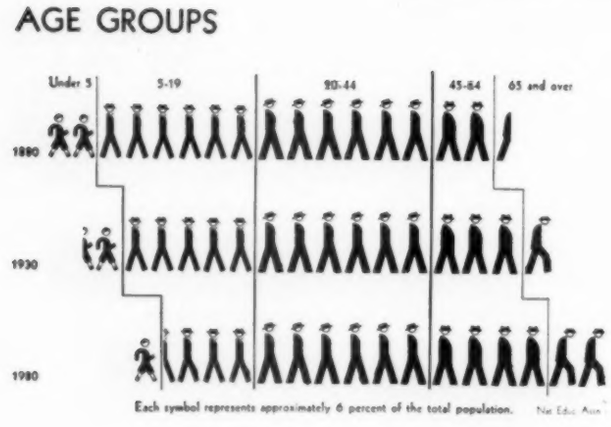
© Nat. Educ. Assn.

INTERREGIONAL MIGRATION



Each dark symbol represents 300,000 population gain thru migration in preceding decade.
Each light symbol represents 300,000 population loss thru migration in preceding decade.

© Nat. Educ. Assn.



Composition of the Population

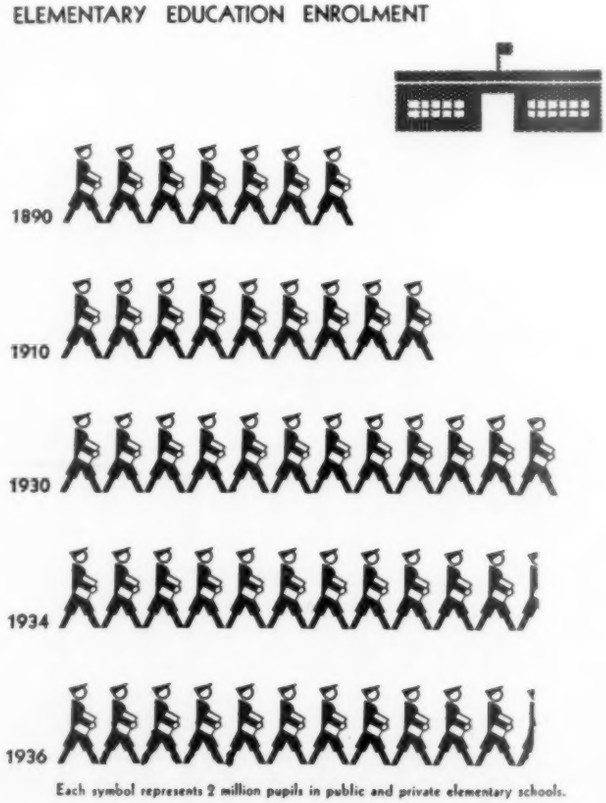
Assuming the continuance of present trends, the proportion of population under 19 years is likely to decline rapidly in the future, while the proportion in age groups 45 years and over will probably show a material increase. Not much change is likely to occur in the 20-45 year groups. The 1930 U. S. Census was the first of the decennial enumerations to record a smaller number of persons less than 5 years of age than in the age groups 5 to 9. That this tendency has its roots far in the past is indicated in the fact that the median age for the total population was 16.7 in 1820, and 26.4 in 1930; now that smaller age groups have begun to appear at the lowest age levels, the median age of the population will continue to rise for some time to come.

Effects of the changing composition of the population have already begun to appear in school enrolments. The first net loss occurred in first-grade enrolments in 1929; by 1936 successive decreases in each entering grade had brought about the first net decreases in the elementary school population. Studies indicate, however, that 90 per cent of this decrease occurred in 19 cities over 100,000 population.[4] The fact that peak birth rates of recent years occurred in 1921-24 makes it probable that even though elementary enrolments are decreasing, the secondary school must continue to expand from pressure of population alone for four or five years longer. College enrolments will probably continue to increase, other factors being equal, for a decade or more. Furthermore, the country may look forward to having a large population in the productive ages 20-44 for several decades to come.

As might be expected from the migration toward urban centers, the proportion of population engaged in extractive occupations has declined steadily since 1880, while distributive and service occupations have been gaining in popularity. Professional occupations, for example, including teaching, have increased tenfold in sixty years. For the most part, the predominant occupations in heavily populated rural areas have undergone but little change. In the Northeast, Middle States, and Far West, however, occupational patterns have come to include major segments of the working population in distributive and service pursuits. Because of increasing economic freedom among women, a larger proportion of the total population is in the employment market than formerly was the case. The requirements of industry are changing so rapidly that the fruits of several years' apprenticeship or other training may be swept away by the introduction of a new machine. In short, the national economy has been transformed from a system organized around the extraction of natural resources to one which requires a wide variety of mechanical, managerial and service functions.

Effects of Changes on School-Building Programs

It is apparent that school-building programs of the future will be conditioned by (1) continuing pressure of population above the elementary school and demand for school services at successively higher age levels, and (2) new programs and procedures adapted to the needs and expressed desires of persons of all ages. More specific conclusions in line with these general observations can, however, be pointed out.



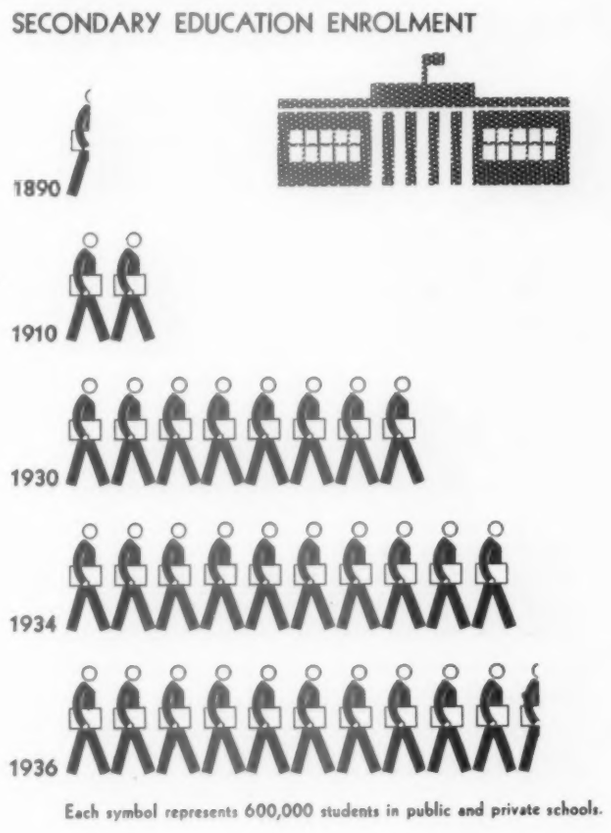
[4] Baker, O. E.: "Population Prospects and Public Schools." *School Life*, 23: 305-7; May, 1938.

Elementary Schools:

At the elementary school level, a declining school population manifestly requires fewer classrooms for maintenance of a given program. Certain compensating factors must be pointed out, however, in order to give a complete picture of the changes taking place. As noted earlier, the greatest proportion of decrease in elementary school populations occurs in large cities. With the financial resources generally available in these population centers, many classrooms which might otherwise be empty may be kept in use through better enforcement of attendance and further broadening of the program. With an increase in the proportion of adult workers in the most productive years and a decrease in the number of children, it should be possible to employ more teachers, reduce the number of overcrowded classrooms and otherwise improve the educational offering. Preschool classes, more extensive programs for handicapped children, new departures in visual and radio education, broader leisure-time and health-education programs, are all ready to be adopted in thousands of school systems as rapidly as facilities will permit. New structures will of course include provision for these and other curricular changes. Migration to the cities is also likely to maintain the present level of school population in some areas; where this occurs and cities are forced to absorb large numbers of underprivileged youth from rural areas, there is additional need for every possible cultural service that each city can render.

Since rural areas are likely to be the reservoirs of future population, rural schools must inevitably undergo further expansion and improvement. Such planning of administrative units as will permit easy transportation of pupils within areas large enough to support a modern program is important. The fact that a large proportion of oncoming youth will be brought up in the South where financial resources for education are low, as well as the tendency of these youth to migrate northward and place an additional burden on schools in industrial areas, points to the need for materially increased Federal participation in school support.

Rural schools will be used to a far greater extent as community centers in the future; planning must therefore include provision for a library, adequate play areas and assembly rooms suited to varied uses as well as the usual classrooms. The need for preparation of some rural youth for industrial as well as agricultural occupations makes it desirable that better provision be made for a broad vocational preparation in the larger rural schools. Both educational and recreational authorities are envisioning the rural school as the dominant unit in a school-play-park area suitable for educational-recreational uses by people of all ages from contiguous areas.



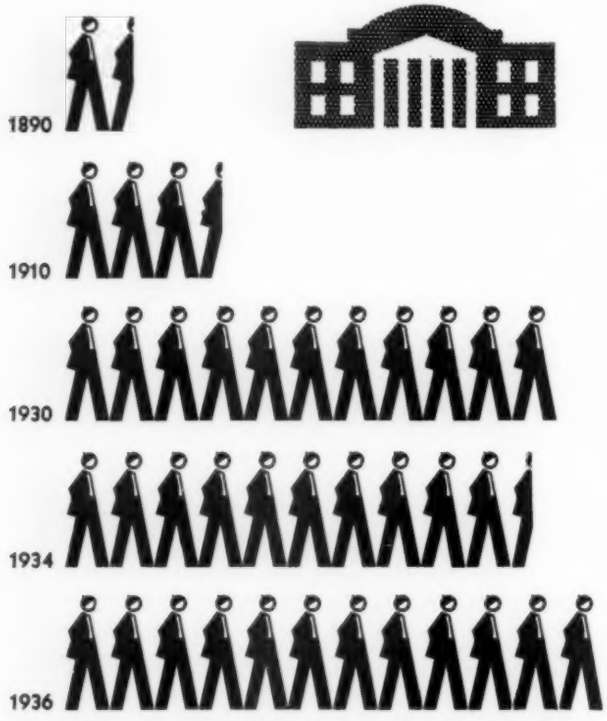
Secondary Schools:

In secondary schools, the present attendance levels are likely to be maintained for some years longer. At present only slightly more than 60 per cent of the population of secondary school age is in school; this, coupled with advancing age of initial employment, will doubtless bring steadily increasing proportions of a growing population into the high schools for some years to come. Not only will existing buildings be used, but many others adapted to the broader and more extensive secondary school program of tomorrow will be needed.

It seems probable that the present-day high school will extend, within a few years, from the present seventh grade through the junior college. The first years will be largely an extension of general education as offered in the later elementary years; as the youth progresses he will be offered both academic and vocational courses, some of which lead toward the university, and others of which prepare him for leaving school at the end of the junior college with a good background of general education. Included will be a broad preparation in leisure-time pursuits.

Further indications are that adults as well as youth will make demands on secondary school facilities.

HIGHER EDUCATION ENROLMENT



Each symbol represents 100,000 students in public and private colleges.

Adult education spurred by cultural and social changes, including increased leisure, is much broader in scope and more necessary to effective living than ever before. Recreation utilized not merely as a pastime but for the purpose of life enrichment is becoming necessary as an antidote for monotonous urban living. Youth migrating from areas that have offered them but meager cultural opportunities soon become adults and require not only *re*-education, but frequently the rudiments of *an* education as well. These are but a few of the broader trends which call for specific provisions in the construction of the modern secondary school. Everything that affects the school is reflected, or should be reflected, in the school building. Planning must make the school edifice an integral part of the program being carried on within its walls.

Colleges and Universities:

Although young people of the usual college ages are outside the jurisdiction of compulsory school attendance laws, powerful social and economic factors have operated to increase enrolments in institutions of higher education.

In 1910 less than 5 per cent of the population of college age was in attendance at the regular session of some institution of higher learning. In 1932 the corresponding figure was almost 13 per cent. The World War was followed by a period of rapid college growth, enrolments increasing 13.9 per cent from 1920 to 1922, and 20.8 per cent between 1922 and 1924. Material gains followed each year until 1930, when the financial depression curtailed the advancing enrolment. According to the latest available report, full-time enrolment for 1938 showed an increase of 6.6 per cent over 1937. The enrolment for 1937 represented an increase of 3.6 per cent over 1936; the year 1936 showed a gain of 6.5 per cent over 1935, which in turn exceeded 1934 by 6.6 per cent. These increases reflect more prosperous business conditions throughout the country for these years and the availability of National Youth Administration work relief to needy students.

Unless this work relief is withdrawn, college and university enrolments are likely to increase generally, at least until the early part of the next decade. The tendency to prolong education at the high-school and college level will for some years more than offset the influence of a declining birth-rate and any increase in work opportunities that now seems likely to occur.

RE-THINKING THE FUNDAMENTALS OF SCHOOL-PLANT PLANNING

By N. L. ENGELHARDT

Professor of Education, Teachers College, Columbia University

PRACTICES followed in the planning of school buildings and in the development of the entire school plant of a community have come largely from the decades in which the educational program was confined to the Three R's and was enjoyed by the masses of children who went through the eight elementary grades and the selected few who were admitted to high-school classes. The entire educational base for which the school plant is today being erected has shifted to include children of the nursery and kindergarten groups and many students beyond the high-school years. The adult-education program has grown apace and will continue to make its demands upon the public-school plant at an increasing rate. The school-building programs and the individual school buildings themselves can no longer be planned in terms of the limited age groups of the past. They must be made to meet the needs of all the population of our communities who aspire to educational opportunity.

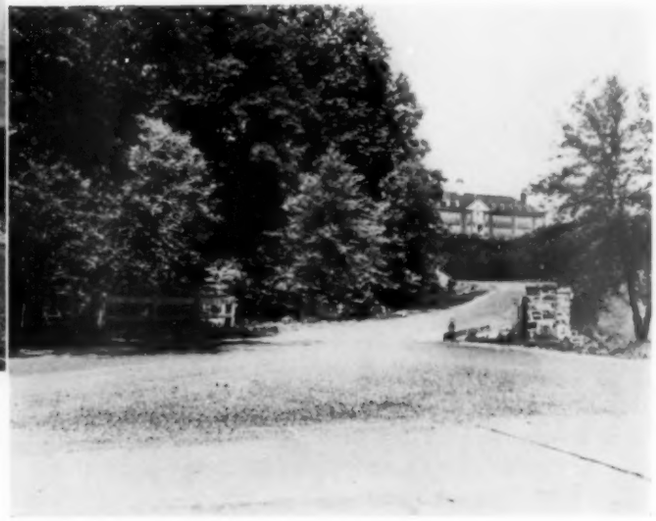
Population Changes

The enrolments of school systems are witnessing great changes in the proportion of age groups attending school. Until recent years the enrolments in elementary schools grew rapidly and the student population of our high schools kept increasing at a fairly steady rate. Within the past two decades great changes have taken place. The elementary school population is feeling vitally the effect of the falling birth rate of the nation and the stoppage of immigration. The lack of employment and statutory restrictions on employment have increased the numbers attending high school, until today approximately 65 per cent of the possible high-school population is now attending school. Some cities have already found it necessary to re-plan the use of the various building units of their school plant because of the rapidity of the change which has come in enrolments at the various levels of the day-school program. For this reason junior high-school buildings have been converted for senior high-school purposes, and elementary school buildings are being used for junior high-school and even senior high-school purposes. The effect of the decreasing birth rate upon school-plant needs has not yet been felt in full. It is safe to say that the result will not be expressed in fewer schoolhouses, but in

Beaumont High School, St. Louis, Mo., lighted at night for community and adult education purposes. In the planning of all future schools, greater consideration should be given to the problems of adult and community use

Above—Slum conditions adjacent to school grounds, as pictured in one of America's large cities, call for better coordination between schools and other municipal authorities in the development of school centers

Below—A delightful environment for a school. A high school in Montgomery County, Maryland, planned in coordination with parkway and park development. Ample acreage has been secured for play areas



educational buildings adapted to the population which exists and which, in all stages of life, will feel the necessity for educational growth.

Urban Decentralization

Improved methods of transportation, and the building of highways and parkways to permit of fairly high speeds for passenger vehicles, have been agencies assisting in the gradual decentralization of many urban centers, both large and small. The creation of residential suburban municipalities has tended to draw wealth and population out of urban centers. The result of this twentieth-century migration from city to suburb and outlying metropolitan areas is found in vacant classrooms in formerly congested city areas. No school system plans a schoolhouse today in a thickly populated section of its old city without the most intensive study of population changes which are taking place.

Slum Centers

American communities have shown great reluctance about discarding buildings which no longer adequately meet the needs of new generations. Worn-out factories, residences abandoned by one stratum of society, and retail stores styled according to the architecture of years gone by, are allowed to stand long after they have served individuals, as well as community, as fully as the original investments warranted. This reluctance to tear down and rebuild has created in cities, large and small, slum areas offensive to a democracy. Old residential centers, formerly maintained at a reasonable economic level, have become tenanted by individuals of a marginal or submarginal economic status. Cities are permitting this practice to develop to their own detriment. It has meant the lowering of tax valuations and the multiplication of police, fire, sanitation, and delinquency costs.

If slum areas are to persist in our cities, the schoolhouses catering to such areas should be infinitely superior to those provided for individuals living at higher economic levels. The schoolhouses should make every provision to offset the inferior opportunities of the homes, to create the means for maintaining individual self-respect, and for re-establishing slum occupants at a more satisfactory economic level. The multiplication of overlapping social agencies for service in such areas is not the solution. The school and the social agencies should unite in developing a community-school-social center in which all the needs of the people may be met through a completely coordinated program.

The Handicapped Child

Many factors have combined to bring about a concentration of planning for improved educational programs for the handicapped child. With the passing of mass education for elementary school children, the lowering of school enrolments, and the improvement of educational methods, the problems of the handicapped child have begun to emerge and to find sympathetic treatment. In a civilization with a declining birth rate, efforts will be increased to protect all individuals, and not only to provide opportunities for the normal child. Handicaps, physical, mental and social, are more readily discoverable because of intensive study and refinements in practices. The physically crippled, the blind, the deaf, the tubercular, the car-

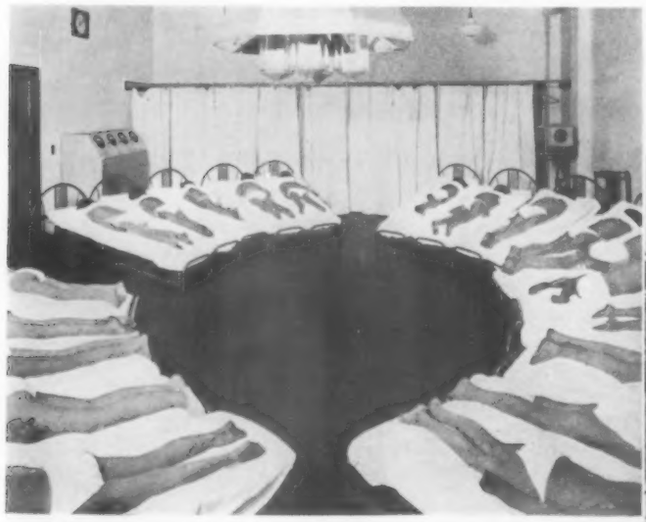
diac, the unfortunate from the broken home, the socially maladjusted, and other atypical children, are being given educational opportunities in our large cities undreamed of three and four decades ago. In planning the school plant, the problems of these children cannot be ignored. The struggle is between institutionalizing them at an early age in expensive hospitals, reformatories, and institutional homes, or providing the educational program in early life which will prevent subsequent expensive institutionalization. This problem has not been given sufficient consideration in the past. It will be one of the factors, however, which will play a great part in the future re-thinking of the school-plant needs for a community.

Coordination of School and City Planning

The American people have often set up organizations to satisfy group needs without a completely coordinated plan. School playgrounds have been developed and parks and playgrounds have been created on entirely separate budgets. Expensive schools have been built and left idle for at least three-quarters of our 24 hours, and other types of buildings, such as neighborhood houses, libraries, health centers, and the like, have been built to serve the same population, frequently with a partial or complete duplication of facilities. With the ever-increasing cry that taxes are too high, it seems reasonable to expect a full day's use of the school plant and the elimination of overlapping among the provisions made. Certainly, it would be more businesslike to spend the available money not in overlapping, but in an expansion of community services. Not in vain need coordination among the forces with the same general educational and social objectives be hoped for. Parks fringed by educational buildings so as to form a community campus, and school buildings incorporating many health and social facilities needed in a community, are developments that can be expected to become realities in many communities.

The Nature of School Buildings

Most people think of schoolhouses as large structures into which children are herded for a few hours of the day in order to meet certain educational demands of society. The very concept of the schoolhouse has become frozen in the minds of many. Continental European practices, and a more or less fixed adherence to an early-adopted pattern, have formed the basis for a common understanding of what a schoolhouse should be. However, the educational program is changing. Physical education and recreation are now thought of as needs for the many rather than the privilege of the few. Opportunity for social growth and understanding can be provided only if the facilities are adequate. Extra-curricular activities have taken on a new relationship to the school life. They are recognized as effective means of education for human understanding, for better citizenship, and for the inculcation of higher ideals. The school itself is considered the place in which children may have satisfactory living under democratic conditions. The massive school structure on a small site should give way to the community-school-campus, for the campus idea can no longer be restricted to students going into colleges and universities. It would seem as though our communities had



Above—The conservation of childhood is one of the most important problems confronting our civilization. At the Ann J. Kellogg School in Battle Creek, Mich., twenty boys or girls can take their sunshine baths at one time

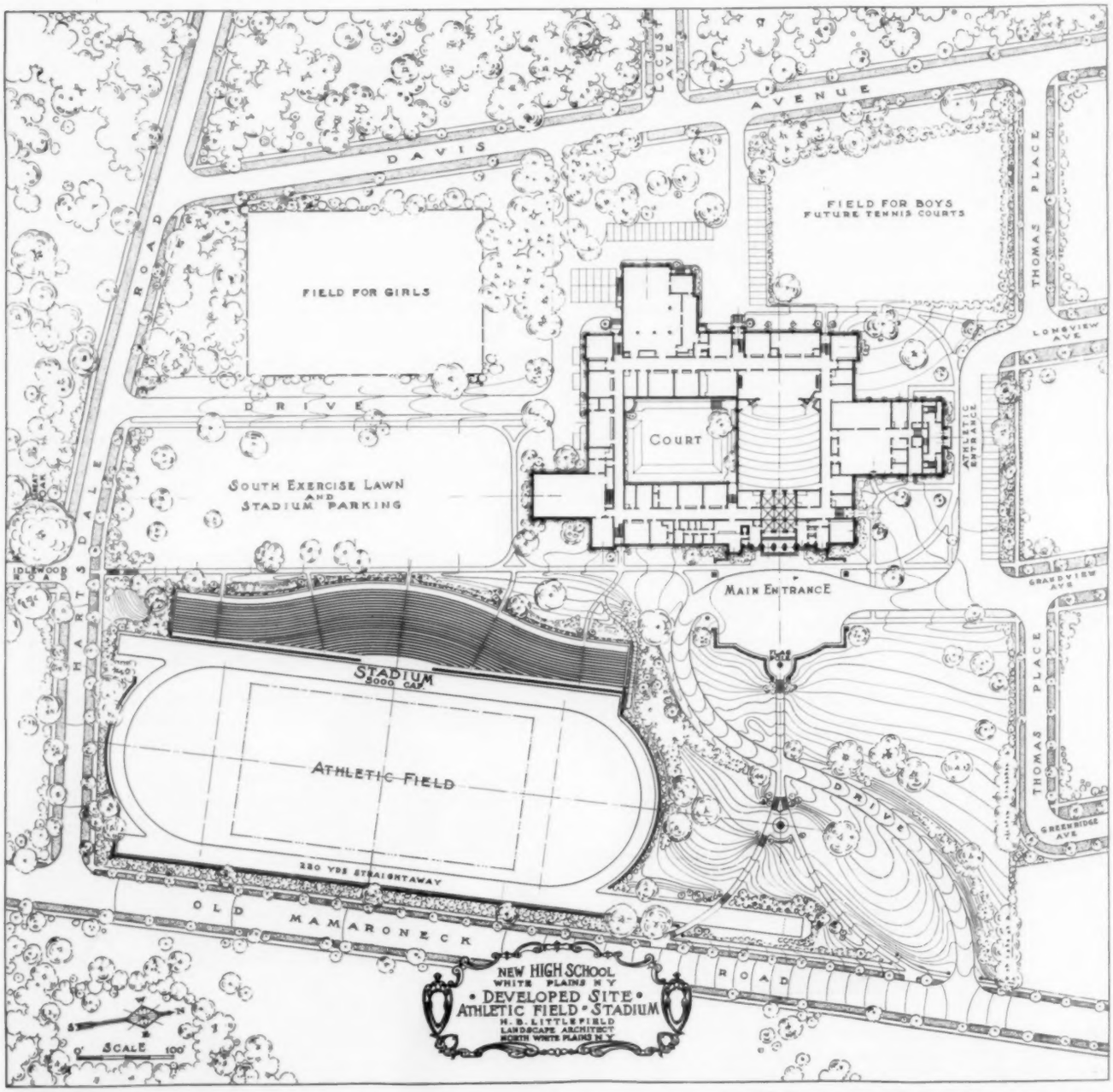
Below—School children enjoy play apparatus on a community playground adjacent to their school. Playground authorities, however, very frequently close their program for the year when schools open. Certainly, coordination between school and play authorities would permit of wider use of the apparatus on which taxpayers' money has been invested

developed many of their school plants with the expectation that the children must wait to enjoy the green grass, spreading trees, and open atmosphere of an educational campus until they got beyond the high-school level of instruction.

The first requisite in future school planning is an adequate school site. No school board should allow itself to plan in a limited way with respect to this point. The school-building unit may be groups of structures planned to meet community needs as well as child needs. One can readily perceive how such school-building centers would not only improve the appearance of many cities but would certainly bring back the valuations which have long since disappeared because of limited planning vision.

The Interior of Schoolhouses

A study of world-wide practices with respect to the kind of environment provided classes of students and their teachers would show great variation. Much emphasis is placed from time to time on the natural environment. American schools have placed the emphasis upon institutionalizing the environment. It has grown out of a worth-while desire to produce situ-



Delightful planning of a high school within a residential area. Landscaping, parking, fields for boys and for girls, and an athletic field, are some of the desirable features of a school plan which are shown on this site

Aerial view of Thomas Jefferson High School, San Antonio, Texas. The school site upon which this splendid school was built was selected before housing had crowded in to make large site costs excessive. The layout of the school has provided for ease of accessibility of major parts of the school for community use

ations in which lighting, ventilation, heating, and sanitation were protected. In providing such safeguards, the social needs of children and the place of teacher and child in the total educational process were given little, if any, consideration. Future planning may be expected to change the nature of the classroom not only because the elements of democratization will be sought early in the educational process, but also because the nature of the curriculum and the emphasis on educational method have been shifted.

Schools may be expected to resemble a series of laboratories rather than a nest of classrooms. The auditorium will be planned not only as a place in which students meekly listen, but for their full participation in the activities which will tend to stimulate their growth. Gymnasiums will not conform merely to the needs of Dr. James Naismith's game of basketball, but will be arranged to meet the needs of games which will become life assets of those who learn to play. Similar transformations may be expected in other parts of the school building. They will be brought about only as interested minds throw off traditional strictures and pioneer in planning to meet the real needs of human beings.

Attractive Surroundings

Man should not build himself unattractive schoolhouses in dismal surroundings. Because he has felt the necessity for living in cities, there is no need to destroy all the beauties which nature has provided. Education will thrive best in a favorable natural setting where man gains inspiration from trees and shrubs, grass and flowers. The inside of schoolhouses need not be developed in such a formal manner as to create undue awe, nor should the corridors and classrooms be so lacking in color and educational stimulation as to depress rather than to encourage. The schoolhouse of a community should be among its most attractive buildings. The school museum should display the community's past achievements. Within the confines of the school grounds and the building units, all kinds of individuals should find every kind of opportunity they may seek for stimulation and self-improvement.

SECTION II
DESIGN AND CONSTRUCTION OF BUILDINGS

THE PLANNING AND MAINTENANCE OF RURAL SCHOOLS

By CHARLES BURSCH
Chief
and
DOYT EARLY
Architect

Division of Schoolhouse Planning, California State Department of Education

FOR our purposes a rural school is one that has special plant planning problems for one or more of the following reasons:

1. *It is small in size.*—Districts are usually limited by the distance a child can travel in going to school. The amount of land necessary to maintain a family limits the population. A community of small farms devoted to truck crops obviously will have more children in an area across which children can travel than a section of country devoted to grain farming or cattle grazing.

2. *It is relatively isolated.*—The rural school district, as the smallest unit of government, divided the rural areas into a patchwork arrangement, each unit of which has as its nucleus the school. Slow transportation, inadequate communication, in addition to time-consuming toil, contrived to emphasize an isolation typical of the environment.

3. *It serves a relatively homogeneous and possibly provincial population.*—The homogeneity in these districts arising from common interests has little parallel in the city. In some cases a hostility to improvements from the outside results in continued use of obsolete facilities.

4. *It generally has a meager basis of financing its plant needs.*—Financing schools through bonds or by direct taxes is difficult because of the limited assessed valuation. The low cash income of the farmer makes him reluctant to deplete it further by increased taxes. In many districts, large property holders, such as lumber or utility companies, effectively check ambitions toward modern schools by threat of unemployment or by other devices.

5. *It is not served by sewer, water, fire department, public transportation nor, in many cases, by electricity.*—The fact that utilities accessible in the city are absent compels the district to provide them, sometimes inadequately. In California there are 383 rural school districts without wells or other source of water supply on the site. While conditions are no worse than those found in the homes of the residents, lack of these utilities creates inefficiencies that sap the energy of both pupils and teacher.

6. *New schoolhousing must replace, or be added to, existing facilities.*—Since comparatively few new rural areas are opening up, there is little opportunity to make a fresh start. New facilities, replacing present ones, are many times affected by what has served in the past.

Offsetting these restricting influences is the cohesiveness of the people and their responsibility for the school. For instance, they give personal effort to cleaning up the school grounds. In many districts the people of the community not only help build the school but maintain it afterward. Funds to buy something needed at the school have been raised by community suppers. The broad general skills of the farmer as well as his tools are convenient for making improvements necessary at the school.

A helpful aspect of rural living is the nature study laboratory ready at hand. Rural experiences are often considered—and we believe properly so—to be the foundation of much of the stability and character found in our national life.

Consolidation—Pro and Con

Better financing has been one of the arguments for consolidation of schools. Consolidation of school districts has improved finances in some cases, but the fact remains that uniting two or more financially weak districts does not make one financially adequate district. Equal educational opportunity, if at all meaningful, must include equality of school plant pro-

visions. Not that rural schools need the same kind of building and equipment that is found in larger schools, but that rural school plant needs should be as well financed as are those in city schools. To accomplish this, county, state or Federal aid for school buildings is required.

Desirable as consolidation of school districts may be, there will always be the necessity for the small rural school. In California, as to a certain extent in other states, this is due to roads that are impassable in winter or to distances that are too great for pupil transportation, or to the impossibility of a feeling of homogeneity with neighboring districts. Such schools have the familiar problems of the teacher with all eight grades and children of all ages. A good system of roads permits a school approximating a city school in size. Adults in such an area are likely to be more cosmopolitan and receptive to progressive ideas. This results in a demand for facilities in addition to conventional classroom instruction. In the small school provision for extra-curricular matters can be secured only through maximum possible flexibility in the facilities provided.

Essential Facilities for the Rural School

The teacher's struggle for position and improved living conditions tends to move the less competent teachers into the rural areas. This naturally further depresses the educational opportunities of rural children. In order to counteract this tendency, the rural school must make teaching more attractive, which may be done through providing modern facilities designed to reduce the sheer effort of teaching to a minimum. This includes some of the facilities of comfort found in the city school. It should mean at least a simple ventilating and heating system, circulating the air so that the classroom is evenly heated. This would banish the unjacketed stove located in the middle of the classroom, which overheats the adjacent area and leaves the perimeter of the room frigid. It should eliminate cross-lighted classrooms with low, widespread windows and blackboards in the space between them. It should improve the sanitary facilities: an accessible and adequate supply of pure water, permitting a drinking fountain, wash-up facilities, a sink in or near the classroom, sewage disposal that is dependable and convenient. It may mean a place where the teacher can live as an individual instead of boarding in the homes of others. Such comforts certainly should be provided where living conditions dictate. If the teacher drives, shelter for her car should be furnished.

The effort of teaching in the rural school could be reduced if janitorial service were better. Sometimes this is maintained by the teacher in addition to the regular duties, or by the children or by some adult in the community. Automatic electrical heat would eliminate the stove with its more or less constant stoking, ash disposal, fuel storage and dirt. Floors in bad condition are monotonously frequent. Black oily floors, splintery, often slash-grain pine floors, are dirty and create difficulties if not hazards. Although linoleum is not always the most satisfactory solution, in most cases it would be a definite investment in better school housekeeping. Generally, insufficient cleaning tools are provided. Brushes, soap, wax, and rubbish containers are absent or ill-adapted. Surfacing the entrance areas to the playgrounds, in front of the school, or where children are apt to congregate in wet weather, will help prevent bringing into the building dirt which grinds off floor finish and creates cleaning problems. A simple, serviceable device frequently seen is an area of removable steel bar grating similar to subway grating, located in the entry over an open shallow pit which receives the dirt and grit from the children's shoes as they enter the building.

Inadequacies in rural school plants are numerous and widespread at the present time. A state-wide study in California a few years ago revealed that over 600 districts were unable to improve bad conditions under the present system of financing and districting. Forty-three districts owned neither site nor building; 16 per cent had sites with large parts unusable for any school purpose. In spite of the large proportion of small schools, more than 11 per cent of the pupils lived more than 1.5 miles from a school building or bus route. Thirty-four per cent of the classrooms had windows having an area equal to one-sixth or less than that of the floor. Thirteen per cent were bilaterally lighted, and 10 per cent had the main source of light in the rear of the room. Thirty per cent had opaque shades. There were 1,342 unjacketed stoves. The common drinking cup was still used in 153 schools. Thirteen per cent had outside privies, and over 8 per cent had no wash-basin of any kind.

The Rural School as a Community Center

The isolation of the rural school suggests a definite need for a community center. As mentioned above, the homogeneity of the district promotes a common interest revolving about the school. Even where an increasing number of city-minded people are taking residence in a rural area, the school seems the most important agency helping to integrate these diverse elements. It may serve as a center for adult interest as well as that of the child. Theaters, clubs, art galleries and museums exert an educational effect on city dwellers which is missing wholly or in part in the rural district. This deficiency should be compensated for in the school serving the area. Such organizations as the Parent Teachers Association, the Grange, 4-H, and Future Farmers provide outlets of community

interest. Devotees of garden clubs may meet at the school. In some communities groups produce plays. Various clubs have been formed having the school as a center; we have found radio clubs and debate clubs. In one school a group were grinding a lens to make an amateur telescope. Other hobbies may be developed at the school. Similarity of interest seems to be a basic motive compensating for the rural isolation.

The education provided in cities through museums and libraries, if it is to exist in rural areas, must be provided in the school. A number of schools have acquired collections of Indian relics, pioneer equipment, and geological specimens which are educational to adults as well as children. Many schools receive books from the county library system, furnishing the collateral reading material needed there, and sometimes a public library is established which serves the community on certain days. This service should be recognized and provided for in the school plan.

If health service is to be available, it must be furnished by the school. Clinics and playgrounds provide this in urban areas. In the rural school it varies from periodic visits of the county health nurse, operating in improvised quarters, to a regularly employed nurse or doctor, with fairly elaborate examination and rest rooms.

Maximum Flexibility

Obviously, the equipment for a school serving such wide ends must be multiple in use. Maximum flexibility of both function and position seems necessary. The well-known "desk and chair" serves better than rows of desks fastened to the floor or to wooden strips. Folding chairs will be necessary to accommodate larger groups who come on special occasions. As only the seats occupied by larger children are comfortable for adults, those occupied by the younger children are best out of the way. Collapsible tables are available and are easily disposed of when they are unnecessary. While the out-of-door classroom is favored in places for carrying on project construction, the gardens so frequently seen in city schools in conjunction with them seem unpopular, partly, perhaps, from the neglect of watering them in summer. While the growing of vegetables or "useful" crops may contribute little to enriching the children's lives, a real opportunity lies in flower growing. One desert school had a collection of cactus, another one in a somewhat better situation had a bed of gladiolus blooming beside the entrance. This beginning can be carried much farther. Native drought-resisting shrubs could be transplanted, or seeds planted. The native growths will respond better in the situation. An extension of the community spirit could work wonders with the school site in leveling, grading, weed cutting, and fence building. Most farmers are masters of so many skills that no great problem should be involved in building fences, walks, or even a septic tank.

Repairs on the Spot

The building should be planned so that repairs may easily be made by the local people. Hardware, windows, heating and pumping equipment should be repairable or replaceable with simple tools and without special skills. A county-wide maintenance truck, equipped to do some of the more complicated repairs, would render a real service. Desk and floor sanding and refinishing, blackboard refinishing, shade repairing, glazing, repair of plumbing, etc., could be economically done by a man skilled at the work. By the use of power equipment expensive to buy for the use of individual schools, and with parts bought in greater volume, the work should be much less expensive when done by the aid of the county maintenance truck.

There should be access to planning service, such as furnished by an architect whom the district may employ, by the county superintendent or a state planning service. Too frequently the school is placed in the center of an already inadequate site, with a woodshed, privies and perhaps another shed or two scattered here and there, thus entirely depriving the children of the opportunity of organized play. There is little doubt that rural children get enough exercise, but sportsmanship, getting along with others, and the acquiring of certain play skills and coordination, are better reasons for proper play areas than merely a plea for more exercise.

Eight Plans for Specific Rural Schools

The plates accompanying this article have been selected because they represent specific planning problems and are the resultants of the many forces that operate in any real situation.

Plate 1 shows a combination elementary and branch high school planned for Loyalton. This is in the lumbering section of the Sierras. The present building has been condemned by the fire marshal. The elementary district has voted its maximum in bonds, and must use its old furniture until funds can be raised for new. Needless to say, it is far from modern. The playroom-assembly will be used jointly by both schools. The heavy snowfall makes this room particularly desirable. The high-school rooms have been specialized to take care of such classes as shop, science, art, homemaking and social science. General classes of course can be held in these specialized classrooms. The shop could not be included in the construction because of lack of funds. The primary classroom also had to be omitted. The present building is located in the middle of the site, preventing adequate play space. The high-school wing parallels the property line, so that maximum play space behind the

school may be devoted to the elementary pupils. The high school will continue to use the field now developed in front of the school.

Plate 2 shows the school recently planned for the Houston School District. This was originally a colony established by a religious group. While close enough to other schools for consolidation, the local unity prevents such action. The present school is being built on the old site to replace one burned. The assembly and a minimum of classrooms were placed

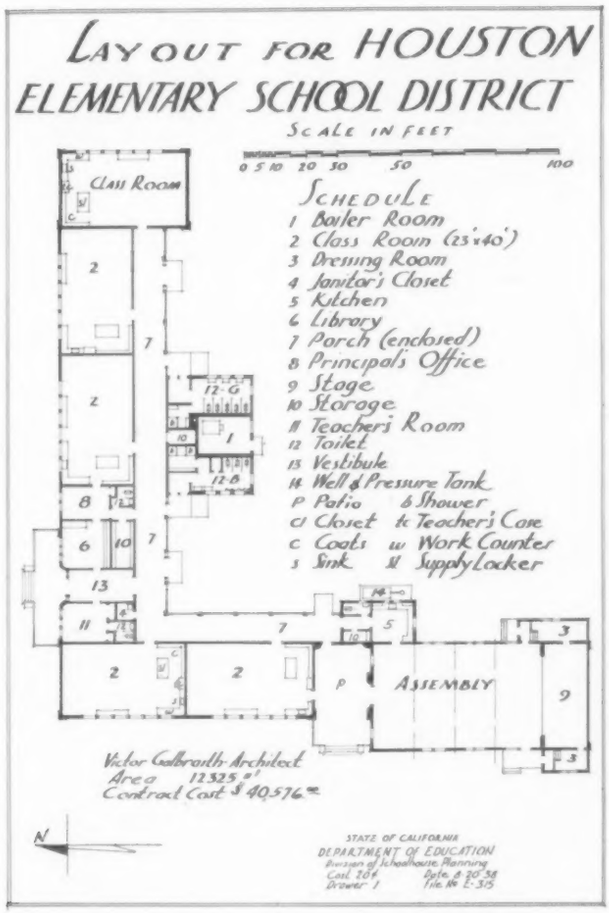


Plate 2

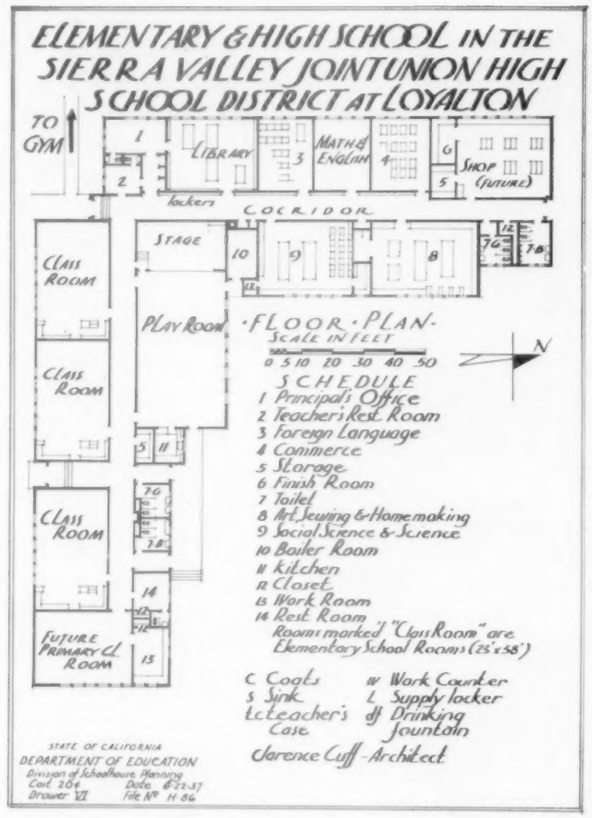


Plate 1

on the west because of the noise from the highway on that side. A secondary road passes along the north side. Since the site is small, an attempt was made to keep the building near the property lines so as to preserve as much play space as possible. The classrooms are 40 feet long and of the activity type. The toilets are located so as to be accessible from the playgrounds. Showers have been provided. A library, serving also as reception room to the principal, is on the left of the main entrance. The location of a kitchen near the assembly makes it possible to use it for a cafeteria as well as a playroom.

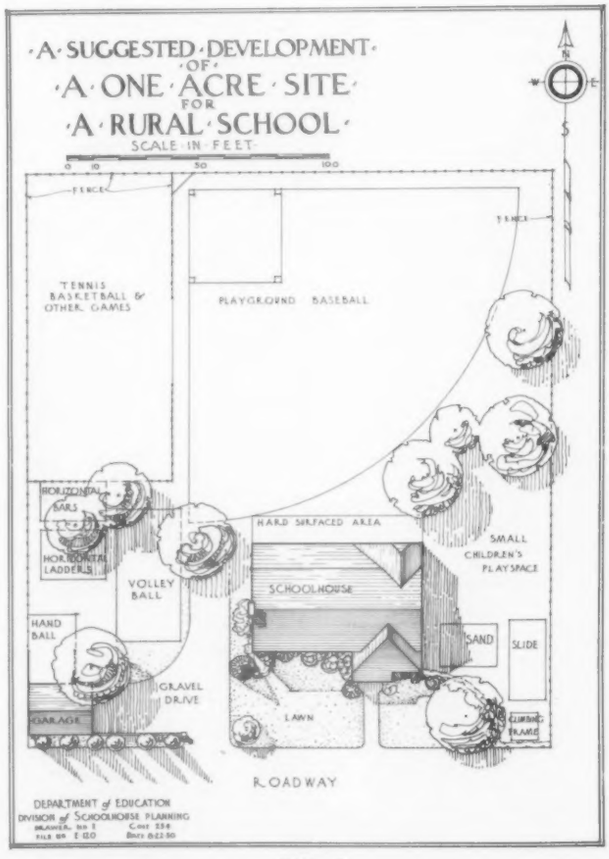


Plate 3

Plate 3 has been adapted from the *Site Bulletin*, published by the California State Department of Education, showing development desirable for a small rural school. This bulletin declares a minimum of one acre for one-room schools, two acres where growth is possible, and three acres for most two-room schools.

Plate 4 shows a new elementary school planned in the semi-desert oil country at Coalinga. This is a very rich fossil-bearing country. A fine collection of fossils is owned by the school. The school plans a better-than-usual health program. In fall and spring pleasant breezes come from the southwest. Occasionally fierce north winds blow. The rooms have been arranged to catch as much breeze as possible yet provide shelter against the bad winds. Children come from great distances, hence the cafeteria. Obviously, we have here a wealthy district able to carry on a program possible in few other districts.

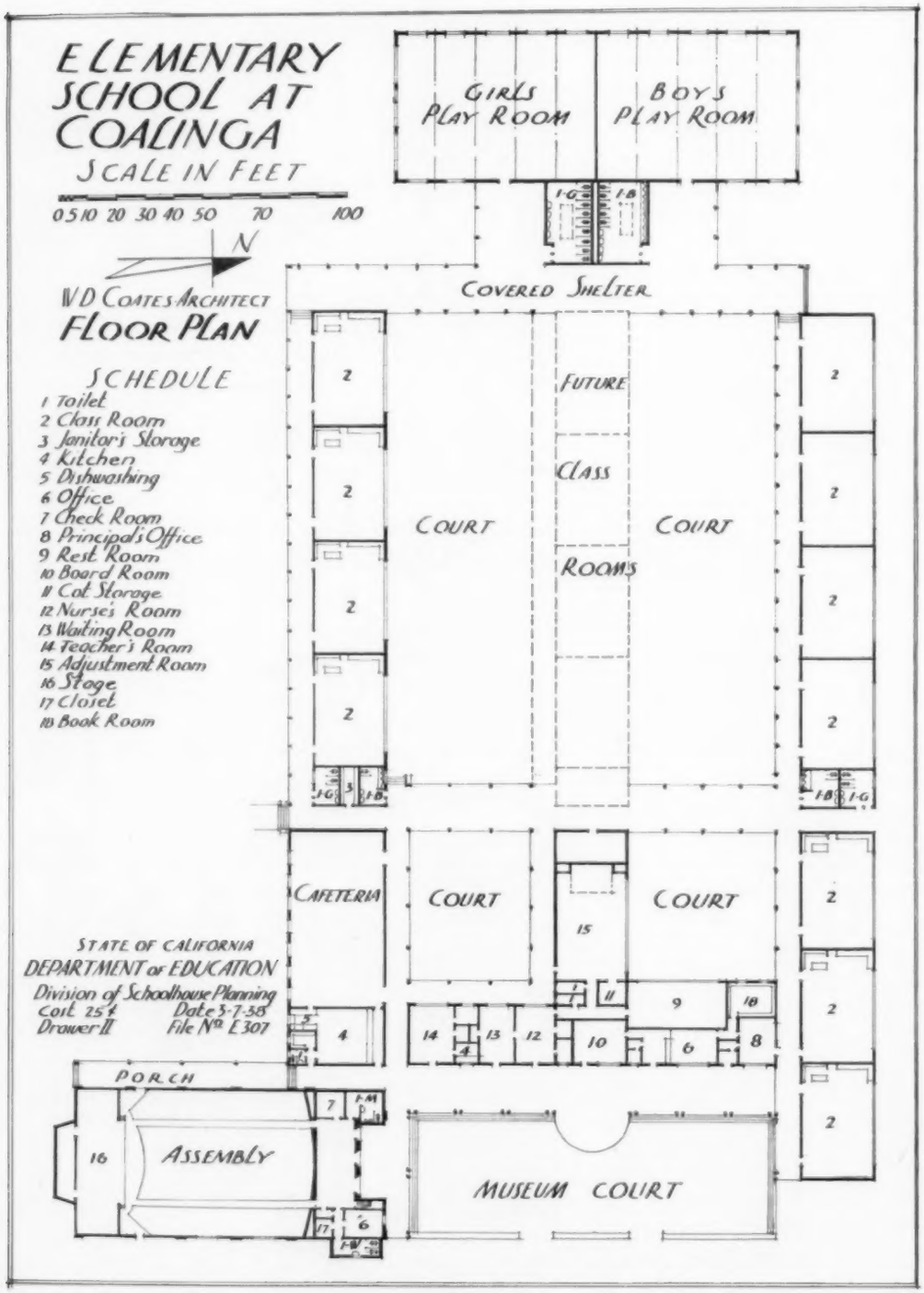


Plate 4

Plate 5 is of the one-room school suggested for the Cuyama District located in cattle country in the back part of Santa Barbara County. Floods in the Santa Maria River often make getting in and out impossible. A teacherage is necessary. There is no other place in the district to get together. A stage is desirable. A kitchen will make the serving of refreshments possible at such functions. It is necessary for the teacher, and may be used to add a hot dish or a little glamor to children's lunches. The stage will be shut off with draw curtains, hence no proscenium has been shown. This will accommodate a maximum number on the platform, as often desired for graduation, community gatherings, etc.

Plate 6 shows a two-room combination auditorium for the Magalia District located in the mountains in Butte County. This is an old

mining community that has barely enough pupils for two teachers and has had almost no growth in many years. A fire destroyed the old school, leaving hardly sufficient insurance to rebuild. Taxes will complete the building as indicated. The removable panels will transmit less sound than accordeon doors, will cost less to install, and we hope will be easier to maintain. A teacherage seemed unnecessary in this case, since Magalia is a small town and satisfactory accommodations may be found. Toilets, kitchen and storeroom, while minimum, will solve many inconveniences.

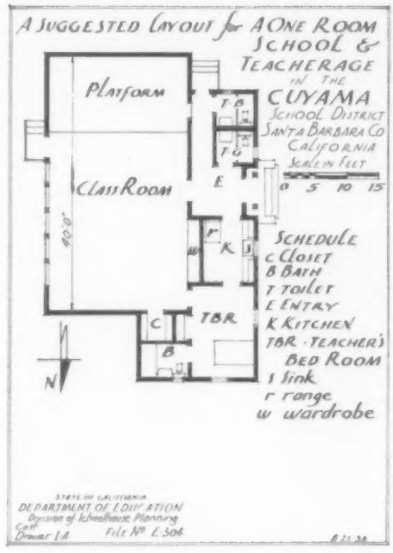


Plate 5

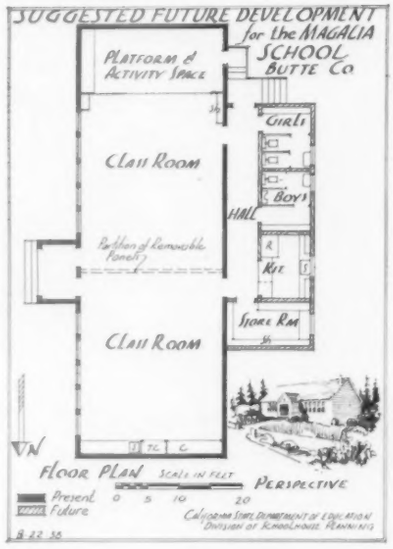


Plate 6

Plate 7 seemed good enough to be shown to the other grades. It went over, and was presented in the auditorium for the benefit of the community, with remarkable success. The principal also teaches. Her office is so located that when she is not there she can be found in the adjoining classroom. An oil-burning steam

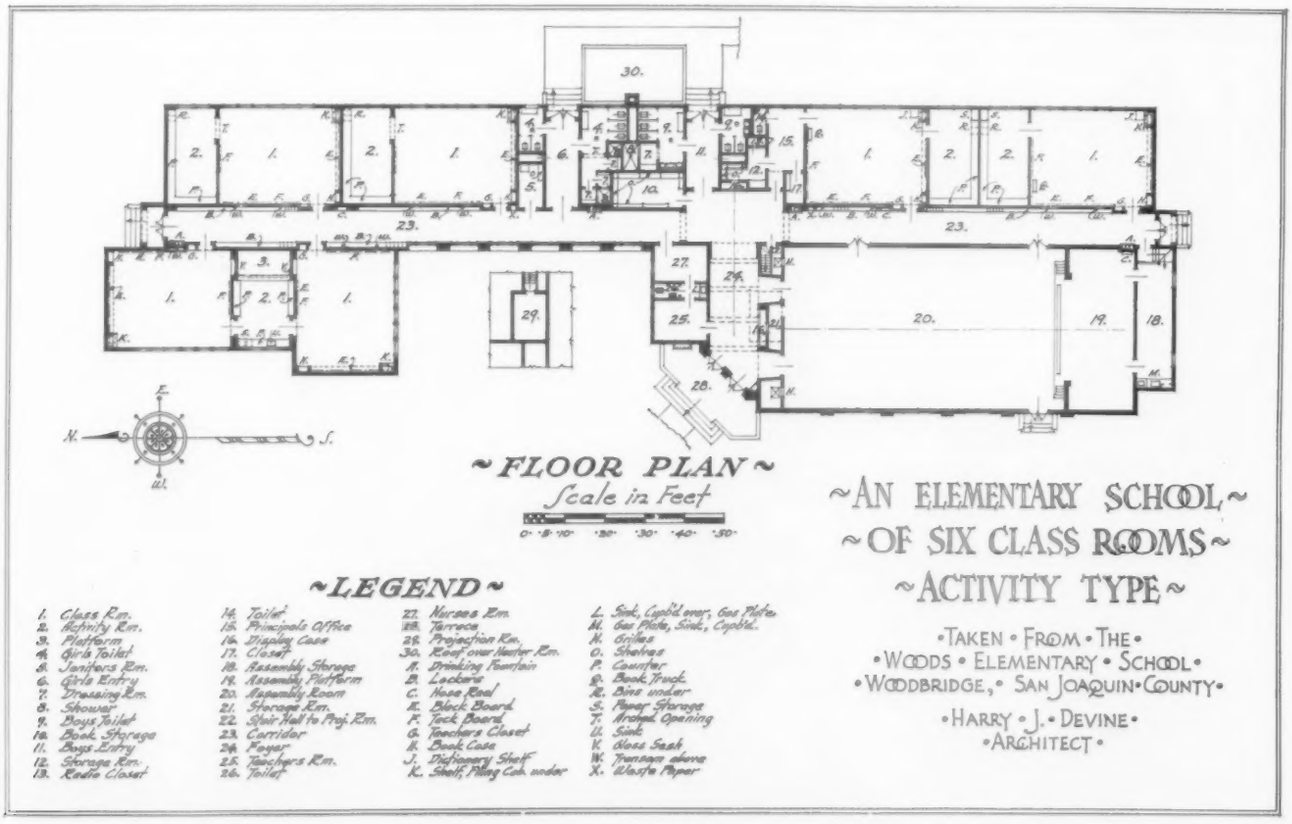


Plate 7

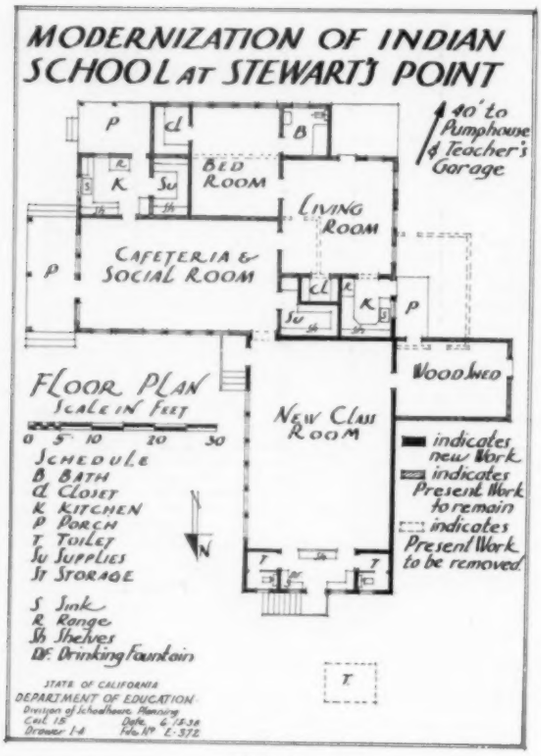


Plate 8

boiler, landscaping and other facilities make this school comparable with city schools. This district is now contemplating the purchase of better shades, better light fixtures, and proper painting, so that light levels will be at modern standards.

Plate 8 shows the modernization of the Indian School at Stewarts Point. While the desirable solution may be to move the Indians away, the realistic thing at the moment is to provide a school good enough to attract a married man teacher who will conduct the social service necessary for the Indians. Federal money in this case has solved a difficult problem. The cafeteria and social room was the classroom. It was too small, bilaterally yet insufficiently lighted. The teacherage, while it did exist, was very badly planned. The toilets, although of the flush type, were outside the building, and there were no walks or surfacing to them. It is planned that the living standards set by the teacher and his wife will help establish a pattern and eventually make it possible for this secluded group to become more independent as citizens. Perhaps better shaped or proportioned rooms might have been secured by starting all over, but the capital invested hardly warranted their abandonment.

THE CONTRIBUTION OF COLOR TO EDUCATIONAL ENVIRONMENT

By WARREN S. HOLMES

Architect, Lansing, Mich.

Old King Cole, in brightly colored linoleum, makes an interesting inset in one corner of a kindergarten floor

MUCH has been written recently about color by those who have made a study of it: of how it is used in commercial advertising to catch attention; in packaging to attract the interest of the potential buyer; in hospitals for the treatment of mental diseases.

All this literature revolves about well-established psychological truths dealing with the influence of color on the mind; and therein lies the importance of this discussion of color in school architecture.

Until recently, hospitals standardized on white because of its hygienic values; other institutions, on drab grays and buffs for maintenance reasons. Schools, for the most part, still surrender their color schemes to the maintenance staff, whose job it is to eliminate the appearance of soiled walls and floors by hook or by crook.

It is easy on both purse and intellect to purchase and apply, over and over again, large quantities of white, gray, and buff paints—but, unfortunately, the psychological tendencies of these colors are towards fear and depression. In modern psychopathic wards, depressed patients are treated in rooms with color schemes of yellow, orange and red for mental stimulation. If the patient be excited and over-stimulated, he is ushered into a green, blue or gray room.

Since color is a visual stimulant, influencing interest and attitudes, it is logical to study its possibilities for education. Unquestionably, it can be made to assist in influencing a child to enjoy learning or to detest it, to make him receptive or unresponsive. Knowing this, the school architect and educator can ill afford to neglect the part color plays in the environment of the school. It is not, as we have supposed, largely a neutral factor in education, but either a deterrent or a motivating force, depending on the care and intelligence displayed in its use. Good combinations of colors are an outward sign of cultural achievement. They do not just happen, but result from knowledge, experience, interest and an artistic mental set.

Moreover, aside from the influence color may have in forming favorable or unfavorable environments for the educative processes, it is extremely important that the school child acquire a feeling for color, and a certain amount of skill in the use of it. He will need it in his dress and about the home, and it will contribute in large measure to his social needs and likely to his business success.

What, then, is more logical than for the school to become an efficient exponent of color?

Purposeful Use of Color in a Michigan School

Color was employed in the design of the new Thomas Street School, Lansing, Mich., with a view to accomplishing certain practical psychological results.

Dr. J. W. Sexton, Superintendent of Schools for the city of Lansing, gave freely of his own time in criticizing and making suggestions for the interpretative art work of this building, and placed at the disposal of the architects the consulting service of his supervisory teaching staff.

It is not unusual for the teaching staff to give study to the educational requirements of a new school building, but it is unusual for them to recognize the educational values inherent in school environments to the extent of giving time and serious study to the suitability of these environments in serving definite psychological ends. A mistake common to school interiors is the almost total disregard of child psychology in their design and decoration.

The interest and attitude manifested by the manufacturers in the art work of their materials has also contributed much to the success of this decorative scheme. Without exception, these companies shared the architect's vision to the extent of faithfully carrying out the designs wrought in their respective materials and absorbing a part of the expense.

A Color Scheme at Work

Let us examine these motives and the results sought, by following the children from the playground to the classroom at the close of recess.

The children have been playing out of doors—running, laughing, shouting—for this is the period for physical exercise (physical education, really). They are in the mood for physical rather than mental gymnastics. But class work is now in order, and the quicker and easier the transition, the better for their education.

The bell rings and they enter the building; their shouting changes into a friendly chatter as they are introduced into a quieting atmosphere—walls and floors in all-over patterns of matt glaze tile; greens and tans predominating, with spots of bright colors—yellow, orange, red, blue—in decorative, story-telling tile inserts.

This foyer is not awe-inspiring or coldly artistic. On the contrary, it is spacious, interesting and inviting; it has warmth of color and emits a friendly greeting; it is here that the classrooms begin their work.

Bulletin boards call the attention of some, the exhibit cases draw a few, the wall-bench is an attraction for a trio—the stage is set, as it were, for an exchange of ideas, and opinions are volunteered as attention is centered on the childish interests on display in the exhibit cases.

In the center of the tile floor is a mariner's compass set in color. Not limited to pointing out the cardinal directions, it goes into detail and challenges the student to interpret NE-E and NW-E. The color scheme in floors, walls, lighting fixtures, and the colorful exhibits of child-craft are intensive, for interest is sought here at high pitch to counteract the activity of the playground.

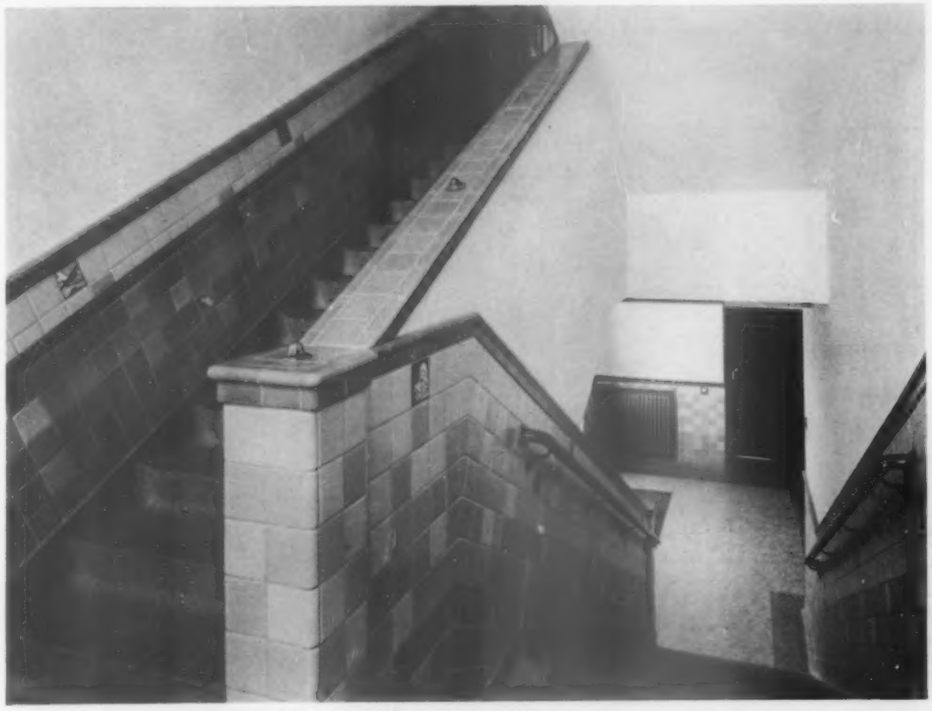
The intensity of the foyer decorations fades into simpler patterns for the corridors, with mottled green tile wainscot and more neutral tones in the terrazzo floor; and, simultaneously, the gay chatter of the foyer fades to a murmur as the children proceed to their classrooms. They now become relaxed and are in a receptive mood, ready to apply themselves to the interests of the classroom. Design and decorations have assisted this by creating a conducive environment.

"Too fantastic and idealistic," do we hear from the traditionalist? On the contrary, this is applied psychology in materials—an example of studied educational environments, a color scheme at work; only one selected out of many in this building, designed to accomplish definite purposes.

Color Treatment in Terms of Objectives

Color schemes for transition are different from those designed for the work of the classroom. In the latter, a restful, comfortable quality is sought, with sufficient interest for the stimulation required to facilitate study.

Oak, stained a pleasant brown, is used for the wainscoting of the foyer; it harmonizes with the several shades of green tile used for the floor. Among the interesting features of the foyer are the animal frieze, exhibit cases, drinking fountain in green and blue tile, decorative lighting fixtures, and the compass detail in the center of the floor



Detail of stairwell, showing the tile wainscoting. The green tiling shades from dark tones at the bottom to lighter greens at the top. Story-telling tiles are inserted at intervals

Attention must be given to light reflection values and maintenance considerations.

Each classroom will demand a somewhat different treatment, depending on the objectives sought. Variety has often been defended as being desirable in the environment of classrooms. The author is prepared to go much further and contend that where best results are sought, variety is absolutely necessary.

The decorative scheme for the classroom should, in general, have a restful quality to preserve harmonious equanimity within the building. Quiet colors should be interspersed with bright, warm colors which are mildly stimulating. Pupils and teachers are thereby influenced to carry this decorative feeling into their work. Its influence will become evident on the bulletin boards and blackboards, in the arrangement of furniture, and in the general housekeeping effect of the classrooms.

The kindergarten in the Thomas Street School provides concrete illustration of these theories.

Color in the Kindergarten

This room is made radiant with the warmth, light and color conducive to health. The semicircular, glass brick bay floods the room with sunlight without the glare that comes from sheet glass. This effect is so perfect that good photographs are secured with the camera lens pointed directly into the glass brick.

The predominant colors in floors, walls, ceilings, furniture and draperies are neutral tints of yellow shading into tans and light browns. The predominant lines are kept strong and simple.

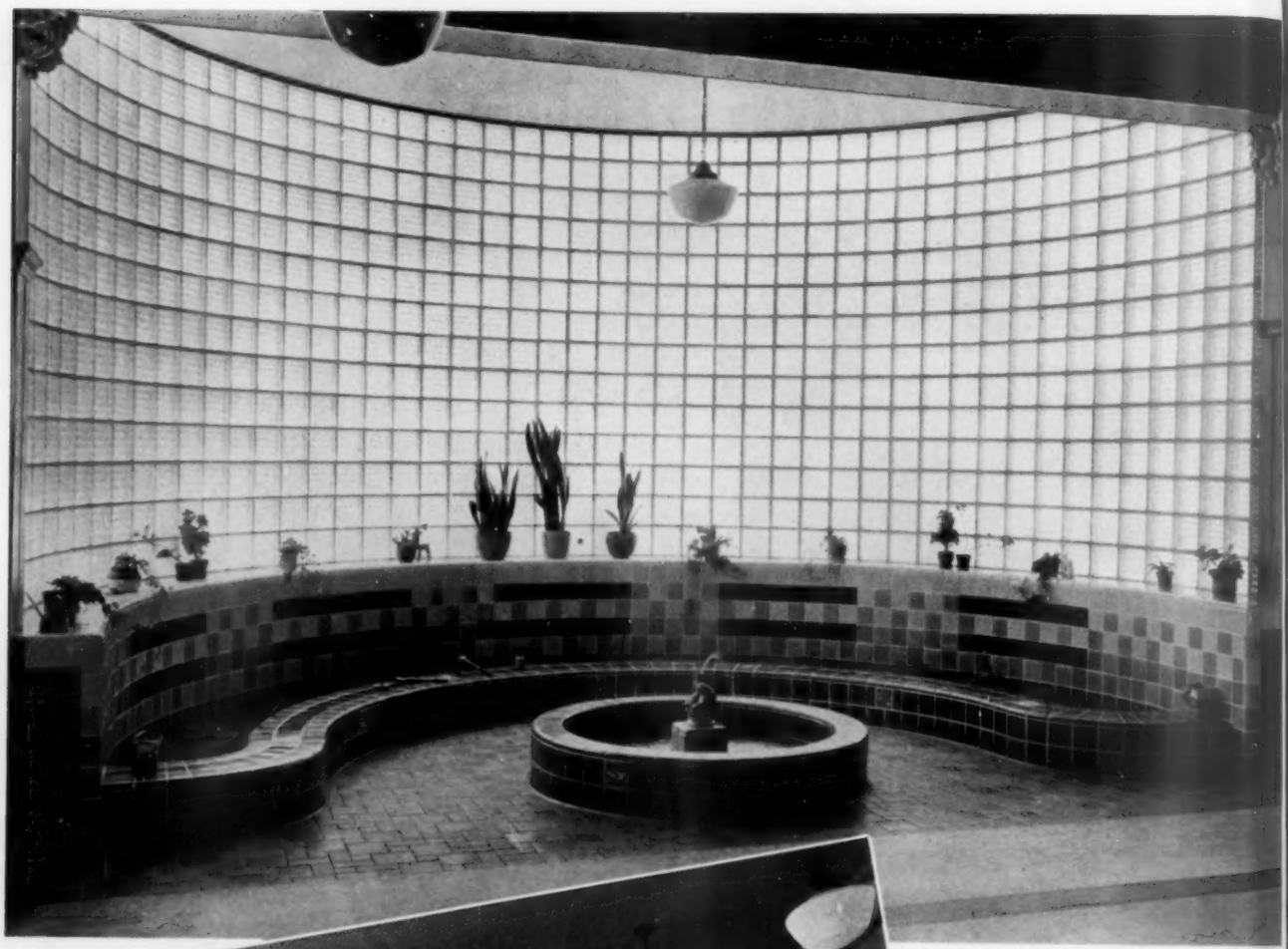
The marbleized texture of the linoleum floors contains a percentage of light grays and greens, and the knotty pine wainscot and the ceiling are in the natural colors of the wood. The greens used are restful and serve to tie this room in with the foyer and corridors.

Into the simple background are worked such construction necessities as the wall cabinets, blackboards, tacking space, doors, built-in growing bins, and sandboxes, the pool with fountain, compartment cases, and the floor ring for story telling. Into the design of these, in turn, are woven the figures illustrating the familiar characters of nursery rhymes and stories commonly used in kindergartens. These figures are highly colored to form the highlights of interest for the room.

In the design of these figures four considerations are scrupulously adhered to. First, they are integrated with the materials they decorate. They are formed of colored linoleum inlays in the floors. In the tile sandbox and pools they are hand-made, colored tiles. In the draperies the figures are carefully selected for child interest, and form part of the stamped designs. They are stenciled into the enamel finish of the furniture; and on the wood trim they are plywood cutouts.

Second, these figures are artistically designed and then executed by skilled artisans to guarantee correct representation, simplicity and maximum beauty.

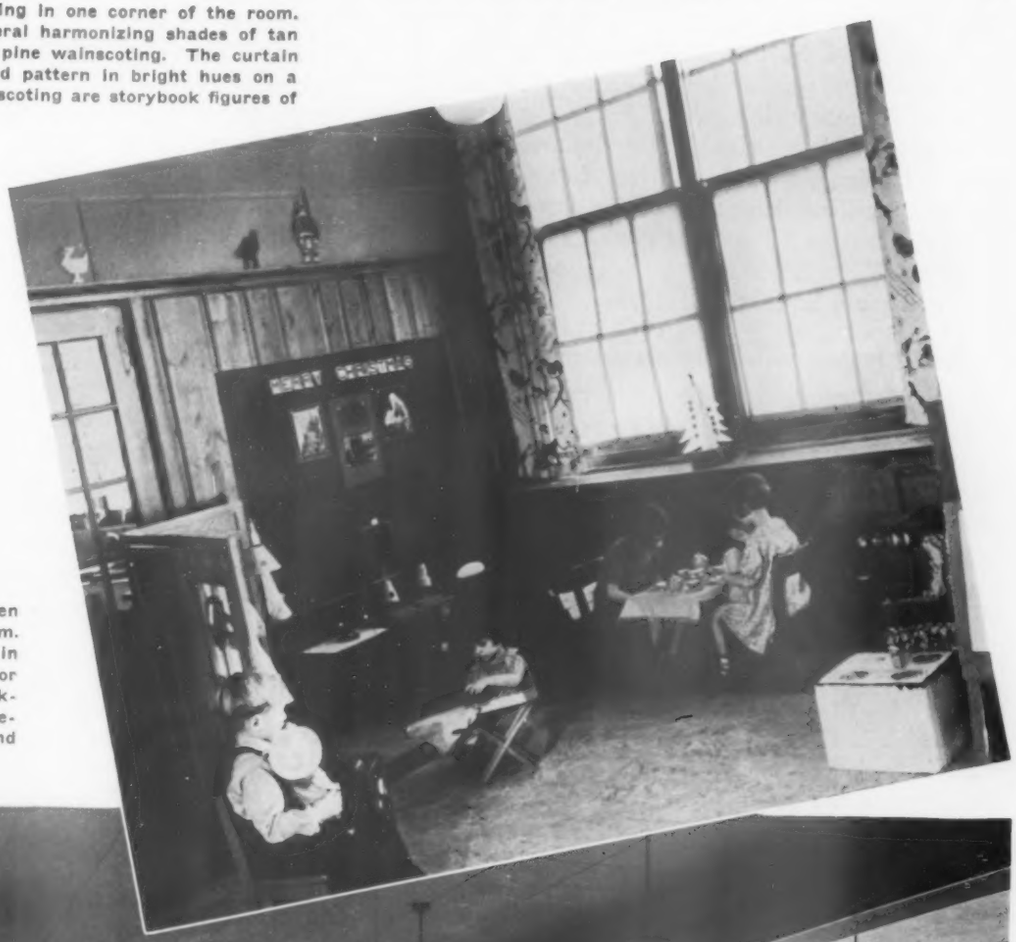
Third, the subject of each design has real significance for the young child, portraying animals, birds, play scenes and familiar story characters.



Above—Detail of glass brick bay, sandbox and pool. The tiles are of brilliant oranges shading to yellows on a brown base, with figured insets in bright blue. The window ledge provided for plants has already been put to use by the teacher

View of kindergarten looking toward the coat room. Exhibit space and cases are provided on the wall at the right, and under the windows are plenty of compartment cases for storing the children's materials. A tiny drinking fountain is within easy reach of the littlest pupil

Children play at housekeeping in one corner of the room. Bands of wallboard in several harmonizing shades of tan are used above the knotty pine wainscoting. The curtain material has a hand-blocked pattern in bright hues on a tan ground. Atop the wainscoting are storybook figures of plywood, hand-cut and hand-painted in bright colors



Below—View of kindergarten looking toward the work room. A colorful octagonal inset in the center of the linoleum floor stands out against the background pattern of tan marbleized in yellow, orange and black

Fourth, elements of comedy and dramatic appeal are incorporated in the designs, and repetition is avoided as far as possible; where figures are repeated, the color scheme is changed.

The finish of hardware, lighting fixtures, electrical trim, clock trim, plumbing fixtures, heating apparatus and furniture throughout the building was determined by the artist responsible for the color scheme for the building. These items are also high notes in color pitch and must be in true harmony.

The Children Belong in the Color Scheme

Since this room is not a picture to be admired, but rather a stage-setting where real actors are to carry on in a well-defined manner, the justification for this colorful environment is its efficacy in facilitating the desirable ends. The final touches in the color scheme are the children themselves, actively engaged in creating, imitating and dramatizing: a group tending the dolls at the doll-house; another trading at the play store; some serving lunch or washing dishes; others building with blocks; some planting seeds that will become real flowers to be tended and admired and reproduced in line and color on the easel.

All is work and all is play. Interest and joy predominate, to the exclusion of all distractions. Concepts are being formed on every hand, not the limited types that result from book learning alone, but rather experience types, so important to success in a practical world.

Moreover, a philosophical justification is not hard to find for this highly specialized environment, in which color in linoleum floors, wall coverings, tile and glass brick plays an important part.

Not least among the concepts desirable in education are those that contribute to character building and culture, which, in turn, are dependent on developing worthy interests and skills; and these, in turn, are dependent in a large measure on suitable environments. Much of education has always resulted from environments, and for most children both the quantity and the quality of their educations are greatly influenced by the environments provided. It is a practical method of magnifying the efforts of good teaching.

The exclamation of surprise frequently heard at the opening of the Thomas Street School for inspection was: "This is certainly a child's building." The anomaly lies in the fact that schools are ever anything else than children's buildings.

Utility in the design of school interiors is unquestionably of great importance; but of equal importance are the art characteristics of school interiors so potent and subtle as to influence irresistibly the child's emotions, interests and attitudes.

Red, white, and blue predominate in the principal's office, with its linoleum floor of mahogany red inset with white stars and border, and its drapes of blue with white stripes. Comfortable chairs for visitors add to the usefulness and informality of the room

HEATING EDUCATIONAL BUILDINGS

By SAMUEL R. LEWIS

Consulting Engineer, Chicago, Ill.

THERE is no particular reason for treating educational buildings differently from commercial buildings so far as heating is concerned. The same general factors apply. If the perfect heating system has been devised, I have not seen it, but I have seen some excellent ones. The outside temperature varies through a wide range during each season and indeed during each day. The heating plant must meet the peak of this range, and during all demands below the peak all adequate heating apparatus continually will tend to overheat the building.

Combined Heating and Ventilation

Practically all educational buildings must have ventilation as well as heating, and the air for ventilating purposes must be warmed prior to introduction into the rooms. When the ventilating and heating are combined, it is possible to adjust and control the temperature of the air introduced into each room so as to prevent overheating and to deliver air in unvarying quantity to all the rooms at temperatures suited to the individual cases. Thus, 1,500 cubic feet per minute of air from such a heating system may enter a northwest classroom at 110 degrees at the same moment that 1,500 cubic feet per minute of air is entering a south classroom at 65 degrees, while the temperature of each classroom will remain at 68 degrees.

Fig. 1 illustrates this arrangement. It is economical in first cost and simple in operation. It is typical of the method of heating in thousands of classrooms in the public schools of Toledo and Columbus, Ohio, and in most of the Chicago public schools.

The tempered air coming from the central supply fan enters under the three layers of horizontal reheating convector. The upper layer and the two lower layers have separate supply valves, and by manipulation of these valves four different variations in the air discharge temperature can be obtained; namely, no increase in temperature, with all valves closed, a small increase with a single layer of convector heated, a greater increase with two layers of convector heated, and a still greater increase with all three layers heated. It is understood, of course, that when steam is used each layer of convector has a separate trap for removal of condensate.

There is shown a single air-supply duct for each classroom (though there may be several such ducts), each duct having a double mixing damper arranged

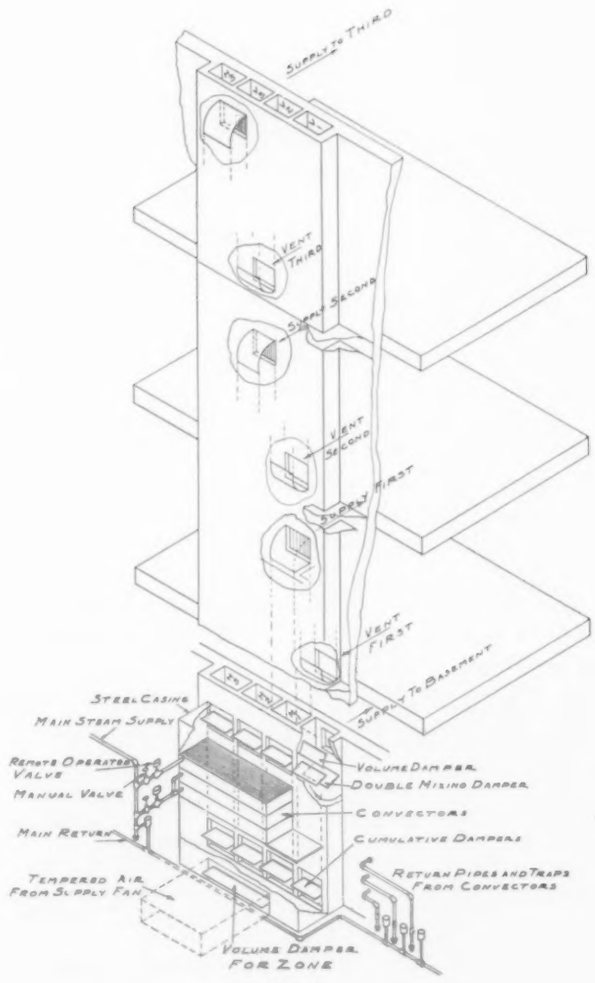


Fig. 1

so that as the warm-air blade closes, the tempered-air blade opens. A room-located thermostat controls the setting of this damper. Above the double damper is a manually adjusted volume damper, for use in equalizing the air supply between the various rooms or for shutting off the air when a room is unused.

At the bottom of each supply flue there is a cumulative heating damper. These dampers in all the flues may be closed simultaneously as a measure of economy when heating the building prior to occupancy. The rooms receive heat as long as the warm-air supply dampers are open, during which time of course the tempered air supply dampers are closed. As soon as any room becomes warm, the damper-setting changes and tempered-air introduction commence, bringing about a reduction in the room temperature.

As long as a room is unoccupied, there is no advantage in ventilating it or in forcing into it air which is cooler than the desired temperature. The air and heat which have brought to the desired temperature the room which happens to be the easiest heated on any particular day, will be available to hurry up the heating of the more difficult rooms. This makes for a considerable saving in time and in fuel. Thus, if the second- and third-story rooms are warm under this scheme, the first-story rooms will tend to receive 300 per cent of their normal supply of warm air so long as the cumulative dampers are closed. In an actual installation, the cumulative dampers are normally open, permitting continuous ventilation of every room. They are held in the closed position by compressed air from one central switch, only during heating prior to occupancy.

In most buildings heated by this type of plant, the classrooms with only one side exposure have no direct radiators, but the corner rooms, or those having increased heat loss for any other reason, have auxiliary direct radiators sufficient in capacity only to balance the respective heat demand with that of the room most easily heated. This auxiliary direct radiation promotes the rapid and simultaneous achievement of the desired temperature in all rooms, without the otherwise usual delay while the most exposed rooms become warm. With such a plant, it is necessary, in order to heat the rooms to an acceptable temperature, that the fans shall be operated and that ventilation shall be provided. In school buildings heated by radiators, with the ventilating system as an auxiliary, there is a tendency on the part of many custodians to neglect the operation of the supply fans, with consequent detriment to health and alertness of the pupils.

Again referring to Fig. 1, it will be observed that the reheating convectors are close to the bottoms of the groups of air-supply flues, and that these convectors may act like so many separate warm-air furnaces even when the fans are not running. There is a considerable heat storage capacity in the convectors, housings, and flues. Thus, flowers and plants on the window-sills of the classrooms do not freeze in the coldest weather even though the supply fans may not be operated between 3 P. M. one day and 6 A. M. the following day.

The reheating convectors, being placed at the bases of the groups of air-supply flues, each with a separate steam-supply valve and main air-supply dampers, form a perfect zoning arrangement against variations in cold-wind direction and against the daily cycle of changes in solar heat reception.

Fig. 2 is a plan of the basement of a typical large junior high school showing one arrangement of the heating and ventilating apparatus which was designed along the lines just described.

Fig. 3 shows the ground-story plan.

The stoker-fired coal-burning boilers are under the kitchen, where such heat as might affect the floor directly above them will be least objectionable. The classroom supply fan takes outside air through an

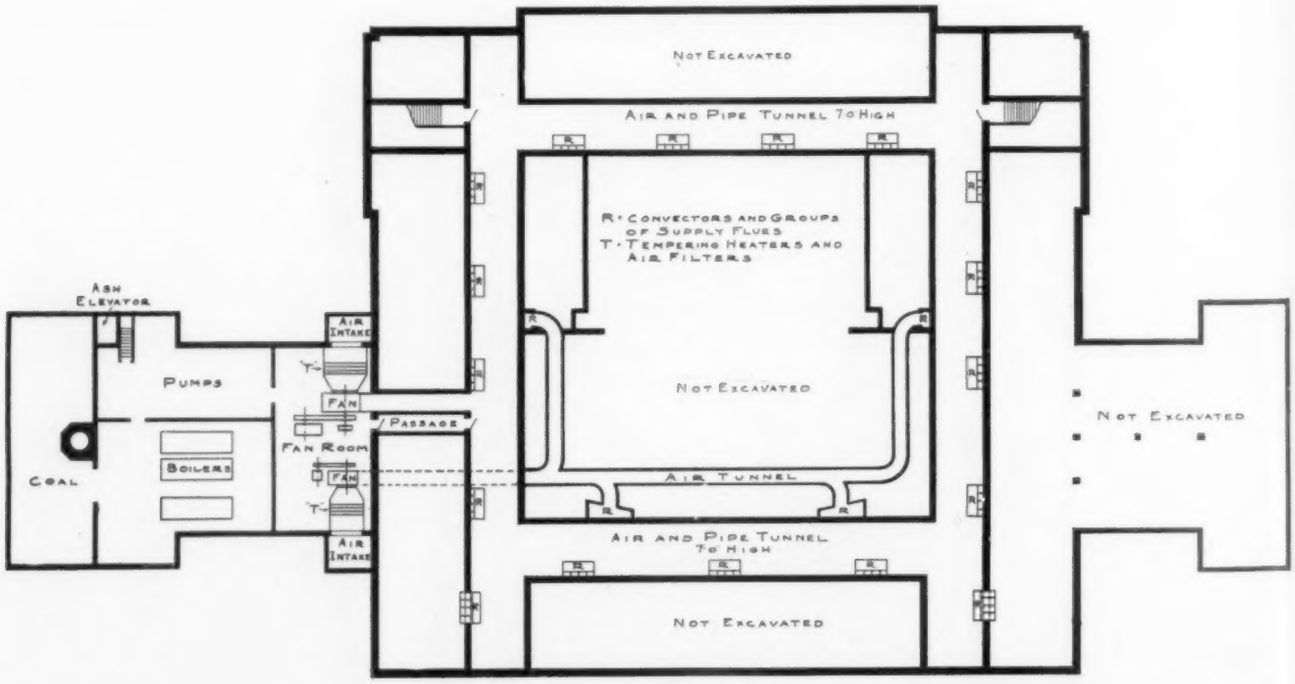


Fig. 2

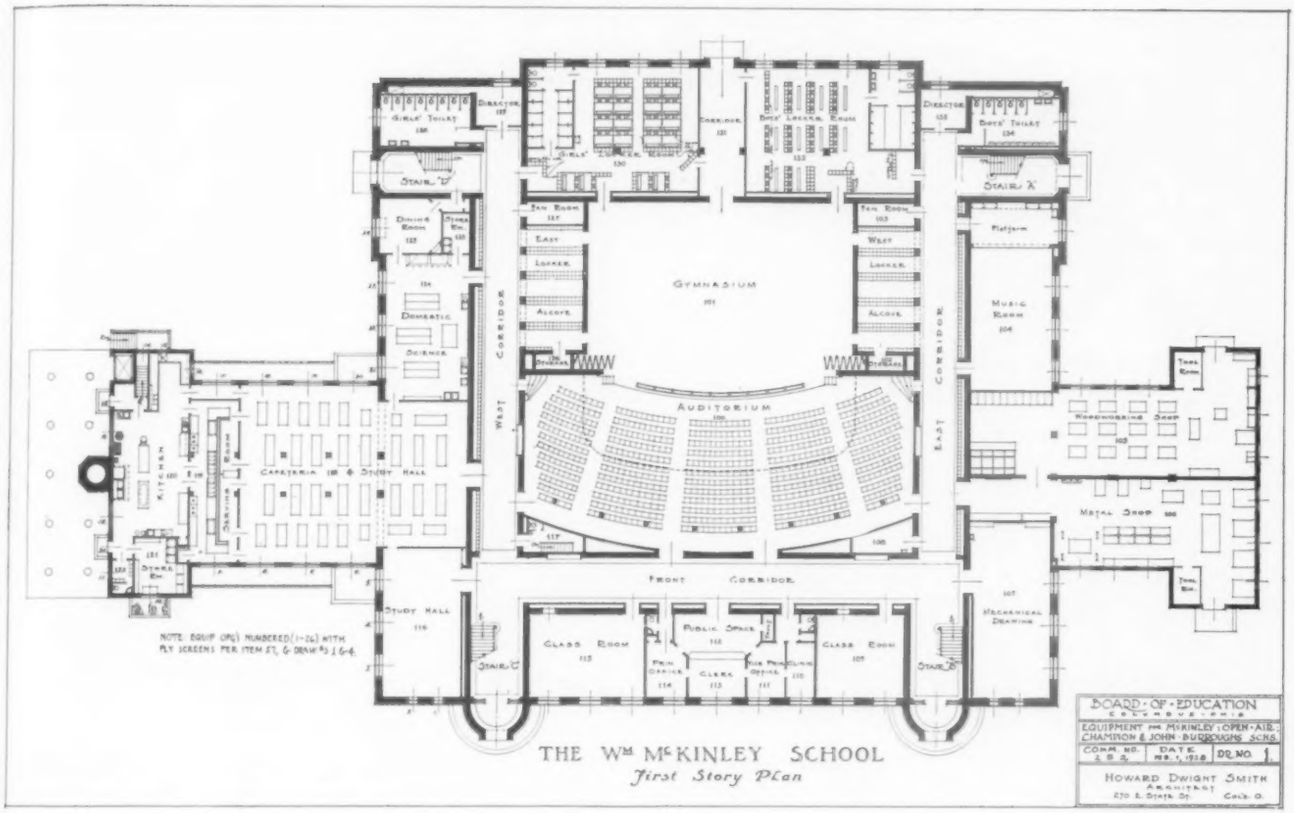


Fig. 3

area-way built up about 10 feet above grade. The air is filtered, heated to about 65 degrees, and humidified. The fan delivers it to the walk-through space under the corridors and to the reheating stations shown. Each station has reheating convectors, as shown in Fig. 1, for increasing the temperature of the air and for delivering it to each room at any temperature required between, say, 65 degrees and 120 degrees, regardless of the temperature of the air going to any other room at the same time.

There is a separate air-supply fan for the combination auditorium-gymnasium, since this room often is used separately from the classrooms.

A pneumatic switchboard permits instant manipulation from a central point, of the steam-supply valves at the reheating convectors and of the cumulative dampers. Usually one-third of the reheating convectors on the sunny side of the building will be warm, two-thirds on the shady side will be warm, and three-thirds will be heated only on extremely cold mornings when preparing for occupancy. The tempering heaters near the supply-fan inlets are controlled thermostatically in two layers; the outer one being heated only when the outdoor temperature is colder than freezing. The inner layer of tempering heater is controlled by a thermostat to leeward of the heater to maintain about 65 degrees. The thermostat operates the steam-supply valve and a bypass damper in parallel therewith. The individual room thermostats control the respective double mixing dampers and the local auxiliary direct radiators in certain classrooms.

The DeVilbiss senior high school in Toledo, Ohio, has stoker-fired boilers in a separate boiler house. A tunnel connects the boiler house with the engine room under the building. This tunnel is wide and deep enough to form a well-ventilated and illuminated thoroughfare, with pipes and cables on opposite sides along the walls. There are separate fans and heating systems for the major departments, such as classrooms, shops, and auditorium. All toilet exhaust fans are in the sub-basement so that there is no danger of cold air backing down the ducts to freeze the water piping, as might be possible with attic-located exhaust fans, in spite of dampers.

The heating system in this building in many ways is typical of those in four other Toledo high schools. There is no basement in this building, except as was necessary to provide full access to all pipes, convectors, and the like. All main horizontal air-supply ducts are of walk-through size, and thus all can be cleaned easily.

The West High School in Columbus, Ohio, is another building heated as described above, and typical of many Columbus schools.

Costs.—Eleven educational buildings heated by the combination system as described, with 342 classrooms and eleven auditoriums and separate gymnasiums, averaged during the winter of 1937-38, 0.352-pound of bituminous coal per cubic foot of building space. In most of these buildings the supply fans were operated by steam engines, so that only an inconsequential amount of electric power, as for toilet and kitchen exhaust fans, was purchased. The cost of coal therefore includes the cost of power for air-supply fans.

Adapted to Year-Around Use.—It may be that some time will pass before complete year-around air conditioning, using refrigeration in summer, will be applied to educational buildings. A few such plants have been installed. It is evident that conventional steam or hot-water direct radiators are not adaptable to use with cooling systems. It is equally evident that conventional unit ventilating machines placed in front of classroom windows and taking air directly from out of doors are not adaptable to use with cooling systems, at least without many changes such as added cooling convectors, dew drains, separate refrigeration piping, controls, etc.

A central system of the zoned all-blast type, however, is well adapted to use for cooling, especially if water instead of steam is the originally designed heat transporting medium. In winter the convectors as shown in Fig. 1 are heated, and the air entering from the main supply duct is at the cooler temperature of the two available, so that any desired intermediate temperature of the air finally delivered can be obtained by mixing.

In summer the convectors shown in Fig. 1 are supplied with chilled water, and the action of the room thermostats is reversed; so that where in winter the vertical blade of the double mixing damper closes when the room is too warm, it opens in summer if the room is too warm. A dew-drain is necessary, and the convectors are somewhat thicker across the air stream than when designed only for heating; otherwise the entire apparatus, except the boilers, is available for cooling as well as for heating.

A Modification

In many of the smaller schools in Toledo and Columbus a modification of the central all-blast system is employed in which the entering air supply for each classroom rises through a perforated baseboard in a thin vertical current along the outside wall.

The air reaches these outlets from the flues along the corridor by passing between the joists, which may be of concrete or of skeleton steel. The air supply is merely tempered to about 65 degrees at the fan and on entering the room rises around and behind a suspended narrow direct radiator, the steam supply to which of course is controlled by a thermostat in each room. The same flue in the corridor wall which supplies the air serves to remove it, since, having delivered the air between the joists, the flue above that level becomes available for other service.

This scheme assures an excellent barrier against cold-air currents which otherwise tend to fall toward the floor below all large cold windows; and if the direct radiation is so reduced in amount that the fan must be operated to gain the increased heat transfer, ventilation will be assured.

Five buildings equipped with split systems using direct radiation arranged in this way averaged for about 70 classrooms, 0.38-pound of coal per cubic foot of building space during 1937-38. The five buildings mentioned above all used purchased electric energy for fan operation, and so the comparison with 0.352-pound of coal per cubic foot for the larger group is less favorable to the buildings having split systems than the figures indicate. In other words, the electric energy purchased, when expressed in coal, might have added 10 or 15 per cent to the 0.38 value.

Operating Costs

The most economical large elementary school heating and ventilating system in my knowledge uses steam engine power for vacuum and boiler feed pumps and for supply fan. No electric power was purchased except the small amount needed for the stokers. It consumed only 0.28-pound of coal per cubic foot and it was in normal service as a grade school all season.

The difference in coal consumption between manual firing with smoke-consuming devices and forced-draft stokers in schools, seems to be, considering averages of several similar elementary schools in the same city, about .02-pound per cubic foot of space heated per season. On a school building which requires 315 tons of coal per season, the saving by use of stokers at this rate would be 18 tons.

Five schools having about 100 classrooms heated by conventional direct radiators and ventilated on the split system basis required 0.42-pound of coal per cubic foot of space heated. The entering air did not pass upward around the radiators as in the buildings which made the record of 0.38-pound of coal, but otherwise the equipment was similar.

Another school in the same city having unit ventilating machines in the classrooms and equipped with an electric vacuum pump, required 0.60-pound of coal per cubic foot of space heated for the same 1937-38 season. Some of this excess coal may have been due to use of cast iron sectional boilers of fairly modern type, but the comparison is significant, since all buildings received the same amount of ventilation per pupil and all have very thorough operating super-

vision, and engineering and architecture of generally uniform design.

Hot Water or Steam?

There is a marked tendency in large central heating plants, such as for colleges, to use forced circulation hot water rather than steam as the heat-carrying medium. The advantages with such a system are: (1) ability to employ the exhaust steam from electric generating equipment at much reduced back pressure in a condenser, the condensing water being pumped to heat the buildings; (2) a central forced circulating hot-water system may use smaller mains and pipes than an exhaust steam system of equal capacity, and the water temperature may be adjusted at the boiler house to suit the weather; (3) drainage of valleys in the underground distributing mains need not be continuous, as is necessary when steam is used; (4) in general, all the piping of a hot-water heating system outlasts the return piping of a steam heating system.

Low-Cost Summer Cooling

Certain administration buildings of universities have been early users of year-around air conditioning. In one of these the exhaust steam from the turbines which propel the electric generators, and which must operate throughout the summer, runs a low-pressure turbine. This turbine drives the compressor for the refrigerant gas. A cooling tower is concealed in the attic of the building, and the water from this tower first condenses the refrigerant and then condenses the exhaust steam from the turbine. This cycle reduces the back pressure on the electric generator turbines or engines, improving their economy, and gains the power for the refrigeration at almost no energy cost except that of the relatively trifling power for pumping the water through the condensers and cooling tower.

Provisions for Maintenance

Maintenance of educational heating systems is a serious problem, and advanced institutions find it wise to employ permanent supervision of high character. Return of a considerable investment in brains and skill is manifest in greatly lengthened service life of boilers and piping and in reduction in repairs. Fuels are purchased competitively on a guaranteed analysis.

The last place in which to practice shortsighted reduction in investment is in underground heat transmission piping between a central boiler plant and the various buildings of an educational group. The main lines at least should be in tunnels large enough for easy access, and these tunnels should be well ventilated.

The provisions for controlling and absorbing expansion and contraction must be permanent and exceedingly substantial. Drainage and air venting must be perfect and accessible. In the design of such services experience and skill particularly are important.

Intelligently maintained central heating systems for educational buildings require frequent analysis of the condensate, particularly to assure adequate elimination of excess oxygen, and constant attention to the boiler feed water to reduce scale. Skillful attention to details in stoker operation and in adjustment of water pumpage and air distribution in three educational heating systems have, to my knowledge during the last year, saved reconstruction investments otherwise thought necessary, to the amount of more than twenty thousand dollars.

The De Vilbiss Senior High School, Toledo, Ohio

CLASSROOM SKYLIGHTING

By

RAY L. HAMON
Professor of School Administration

and

ROBERT F. KUNKEL
Graduate Student

George Peabody College for Teachers

IN even suggesting the revival of this idea we realize that we are reopening a question which has been closed by most authorities as a dead issue. Though skylighting has been employed in almost every conceivable form in all types of buildings, the idea has been pretty well abandoned by educators and school architects as impractical and unsatisfactory. In spite of its negative history, however, we dare call attention to some of the more obvious advantages of skylighting which may have been overlooked—the possibilities of north saw-tooth skylighting of instructional space. We feel that this field has not been sufficiently explored.

Structural and Mechanical Difficulties

The saw-tooth skylight has never been popular with school architects, largely because of the difficulties of architectural design, structural framing, leaks, heating, ventilation, and condensation. The north saw-tooth skylight is used extensively, however, in industrial buildings, generally in the grading rooms of textile plants, where the greatest accuracy is required in distinguishing slight variations in color. Such extensive industrial use should be proof enough that it is not a fantastic idea which has no possibilities in public school construction. Even the architectural difficulties may now be solved by absorbing the saw-tooth in a modernistic composition.

Those interested in the structural and mechanical difficulties of saw-tooth skylighting are referred to pages 868-73 of Parker's Eighteenth Edition of Frank E. Kidder's "Architects' and Builders' Handbook" (John Wiley and Sons, New York). In his discussion of the advantages of saw-tooth roof construction, Kidder makes this significant statement:

"While testimony of those who have had experience with saw-tooth roofs is almost uniformly favorable, some difficulties have been experienced, practically all of which may be summed up as due to either faulty design or poor workmanship."

The disadvantages listed are leaks, poor ventilation, excessive heat, and excessive condensation. Kidder goes on to say that if approved methods are applied by competent engineers and architects, these difficulties may be obviated. This is followed by a brief discussion of how each of these difficulties may be overcome.

Some Obvious Advantages

Unilateral lighting has been universally accepted. Even if bilateral lighting from perpendicular sides were acceptable, it would be possible only in corner rooms. If bilateral lighting from opposite sides were acceptable, it would be possible only in one- or two-room schoolhouses. Hence, we seem to be committed to a classroom which must be dark on one side. With all the present scientific knowledge regarding the necessity of adequate light, we still deny its advantages to the pupils who must occupy the dark side.

The general practice is to design classrooms from 21 to 23 feet wide with 12-foot ceilings. In such a room with windows extending to the ceiling and no shade interference, the light on the dark side of the room is only a fraction as bright as on the window side. When shades are drawn from the top, the difference is increased. In thousands of classrooms artificial lighting is not available. Even where it is available, why resort to electricity when just above the roof there is ample daylight? Overhead lighting when used to supplement unilateral lighting does not create objectionable cross lighting as in the case of bilateral lighting. If overhead lighting were objectionable as a supplementary source, artificial lighting would not be practical.

A north saw-tooth skylight gives uniform diffusion of light throughout the room. If the skylight is properly placed, there is no sun interference, and window shades are not needed on the skylight. Hence, regardless of the direction of the sun and the required position of the shades on the regular windows, there is a constant source of natural light as long as there is outside light. Even if electricity is available, the north saw-tooth skylight is a better and cheaper source of supplementary light. Of course, electric lights should be installed, if current is available, since this source will be needed on both sides of the room on very dark days and at night. There is no need, however, to buy electric current when adequate daylight may be had by merely providing a place for it to enter the room.

Another limitation is that the saw-tooth skylight must face almost due north to avoid sun interference without the use of window shades. The extent to which the skylight may deviate from due polar north will vary according to latitude and the time of day

and year for which sun interference must be avoided. The time of day will also vary according to the relation of local time to sun time. Another limitation is that the skylight must be nearly vertical. The extent to which it may deviate from the vertical will depend upon the same factors affecting the horizontal position.

Skylight Angle

To determine the possible deviations from polar north and true vertical without sun interference during school hours, an experimental study is being conducted at George Peabody College. In order to make this study, a schoolroom model has been constructed to one-eighth actual scale, or 1½ inches to 1 foot, on the basis of a standard classroom 23 by 30 feet with a 12-foot ceiling. The windows are arranged in a single battery and have an exposed glass area equal to one-fifth of the floor area.

By pivoting the classroom model and at the same time regulating the vertical angle of the skylight, it was determined that on the summer solstice (June 21) the maximum deviation from vertical for the latitude of Nashville, Tenn., is 5 degrees. If the skylight has a greater deviation, direct sunlight cannot be avoided at Nashville from 9:00 A.M. to 3:00 P.M. (Central Standard time on June 21). It was also found that the skylight at this vertical angle must face approximately the polar north during these hours on June 21 in order to avoid sun interference. The deviation from due polar north may be increased without sun interference during school hours if (1) the vertical angle is decreased, (2) the school day is shortened, (3) the school year ends before June 21, and (4) the location is farther north.

The fact that there is so little possible deviation from polar north without sun interference constitutes a serious limitation. Unless school buildings are set almost square with the polar compass, it will be necessary to design skylights at an oblique angle to the building axis, which will involve additional problems. Naturally, the effectiveness of the lighting will be increased by sloping the skylight back as much as possible from the vertical position.

The north saw-tooth skylight was used on the recently constructed high-school building in Greenville, S. C., to supplement the lighting of a library which is 56 feet wide with windows on one side only. This skylight gives excellent results, except that it permits some sun interference during the last afternoon period in late spring, because the skylight has a 13-degree deviation from the vertical and faces about 10 degrees west of north.

Skylighting supplements the window lighting of the Greenville (S. C.) High School library

Position of Skylight

The Peabody study is also concerned with the distance of the skylight from the dark wall, and the slope of the skylight roof with relation to the room ceiling. An attempt has been made to determine the optimum relation of these factors for the most effective lighting results. The study is incomplete, but it is believed that some significant results have been obtained.

For this portion of the study the same model has been used. The roof is built so that it can be turned around, placing the skylight either on the same side as the windows or on the opposite side from the windows for studying north-and-south rooms. A different type of roof will have to be constructed for studying east-and-west rooms. The readings used for determining the most effective position of the skylight and the slope of its roof have been taken with a 4-foot skylight facing away from the sun, and with a 5-degree deviation from vertical.

Through the center of the room, extending from the windows to the opposite wall, there is a platform on which a foot-candle meter can be moved across the room at the desk-top level by outside control. By the use of an extension cord on the meter, it can be read from the outside as the photo-electric cell is moved back and forth across the room inside the model.

Figure 1 shows a cross-section of the classroom model used in the experiment for a north room. The figures at the bottom of the drawing indicate the positions of the rows of seats from the window side. The skylight is indicated by the letter B. The distances represented by A, C, and D are adjustable. Many readings have been made with A, C, and D adjusted to different lengths. The arrangement shown in Figure 1 gives the best results of any combination so far determined with the present model. Obviously, the light will increase with the length of B; but it is assumed that 4 feet is about as much skylight height as can be absorbed in the architectural design, and that less than this will not give uniform light throughout the room. The broken line represents the range in the intensity of light from the first row of seats nearest the windows to the row on the opposite side of the room, when the skylight is *not* used and the regular windows face north. The solid line represents the range in intensity of light in the room with the same outside light source and the model in the same position, but with the skylight functioning in the position shown in Figure 1.

It will be noted that when the skylight in the roof was completely closed and the model was in every way comparable to the ordinary classroom, pupil stations nearest the windows received 18 foot-candles of light, the reading drops to 13 on the second row, and is only 6 foot-candles on the fifth row. These readings were taken on an average day, with 20 per cent glass area, and no shade interference. The relative readings are comparable with light sources of other intensities. In contrast to this situation, note the variation in intensity when a skylight is placed at an angle of 5 degrees off vertical and located as shown in Figure 1. With the saw-tooth skylight running the length of the room, the intensity on the first row of seats is 23 foot-candles, and 18 foot-candles on the last row. The minimum pupil station with the skylight has as much light as the maximum station without the skylight. This set-up gives uniform distribution. The highest intensity is only 13 per cent above the average, and the lowest intensity is 12 per cent below the average. When similar computations are made for the ordinary classroom without a skylight, it is found that the highest intensity is 66 per cent above the average, and the lowest intensity is 44 per cent below the average. It might be further noted that the 4-foot skylight nearly doubles the average reading.

Readings have also been taken with the regular windows facing the sun, and the saw-tooth skylight facing the opposite direction, a condition which exists in a south room with a north skylight. This condition is illustrated by Figure 2. In this experiment, light-tan translucent shades were drawn, so that there was no direct sunlight on any desk. The results obtained were similar to those obtained for the north room.

This is a preliminary report on a study which is still in progress. The results so far seem to justify further research and experimentation. A better model is being constructed and the study will be continued with more refined equipment.

The north saw-tooth skylight may be used on the short axis of east-and-west rooms. The saw-tooth roof construction could be designed perpendicular to the corridor and extend about two-thirds of the way across the rooms on both sides, thus lighting the corridor as well as supplementing the light on the dark sides of the classrooms. By using the north saw-tooth skylight on the long axis over the dark sides of north-and-south rooms, these rooms may be lighted as effectively as east-and-west rooms, thereby making it possible to use north-and-south as well as east-and-west orientation for classrooms in single-story buildings.

Some Limitations

The saw-tooth skylight has certain definite limitations. In the first place, this method of lighting is applicable only to one-story buildings and top-story rooms. Such rooms, however, probably house the majority of America's school children. For the most part, the schoolhouses where electricity is not available are of the single-story type.

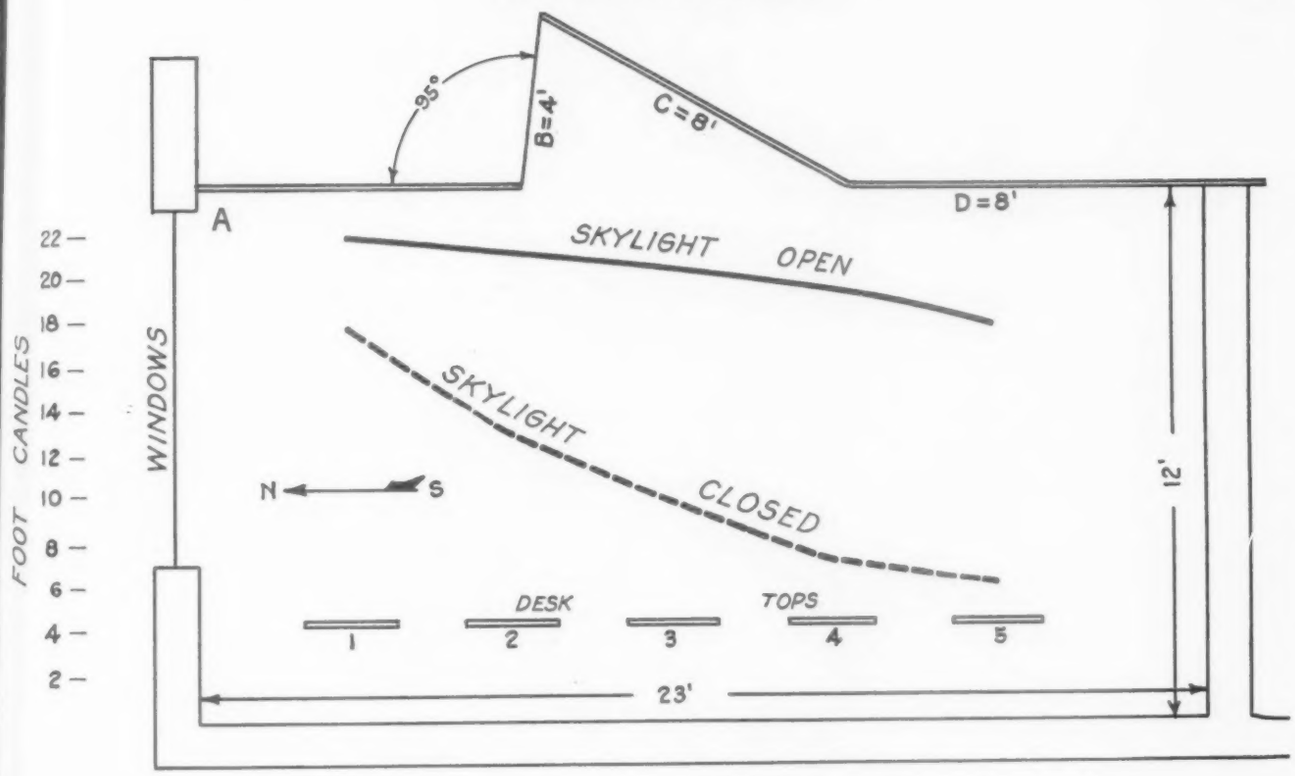


Fig. 1—Cross-section of north room, showing effect of skylight (B)

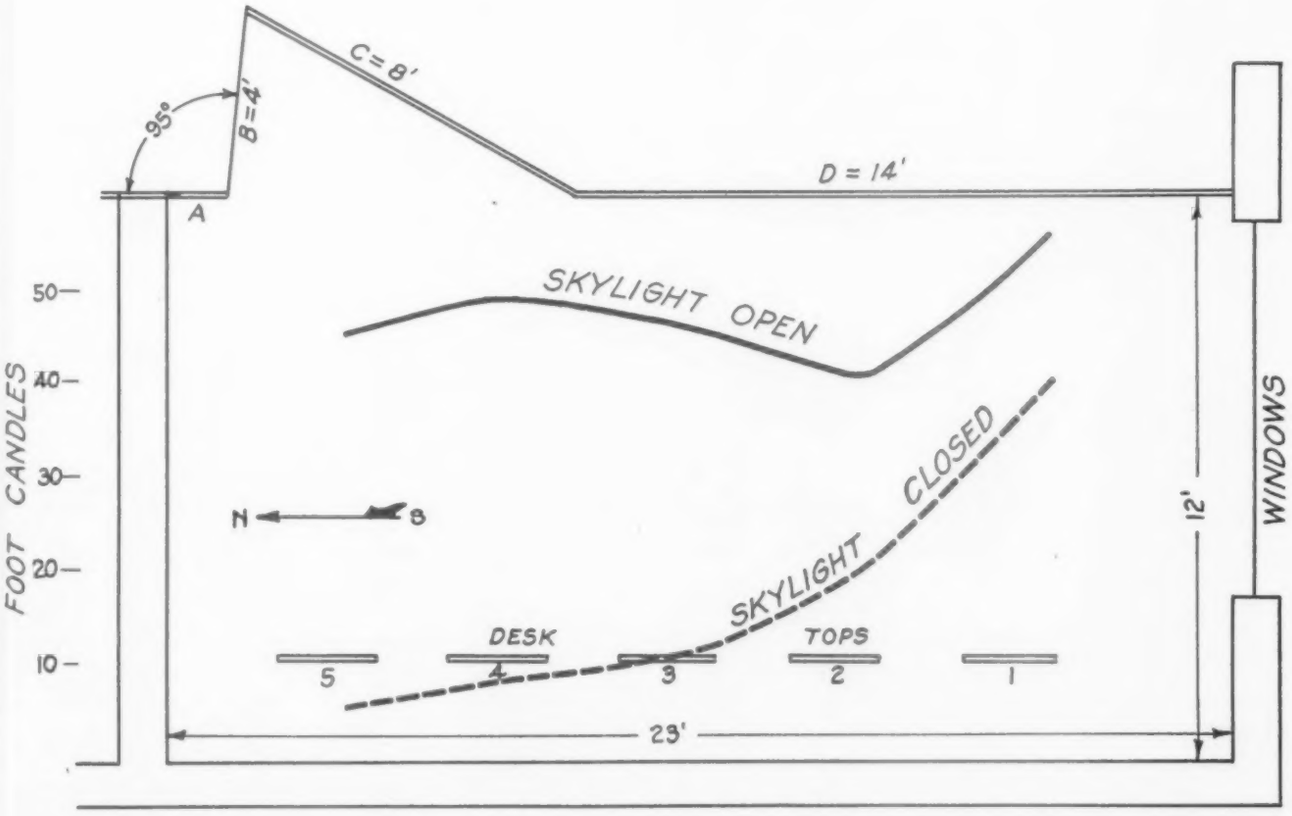


Fig. 2—Cross-section of south room, showing effect of skylight (B) when shades are drawn

PLUMBING REQUIREMENTS OF EDUCATIONAL INSTITUTIONS

By CHESTER A. SLOCUM

Consulting Engineer, Slocum & Fuller, New York City

A GOOD and efficient plumbing installation in an educational institution not only produces a healthful and sanitary condition within the building, but tends to increase the efficiency of administration, adds to the comfort of the pupil, and sets an example for cleanliness. In the belief that educators and school administrators should have the facts set forth regarding the importance of a well-designed sanitary system, showing the progress in connection with plumbing installations within the last few years, the following items are recorded as having given great satisfaction in a large number of elementary and higher educational institutions.

The arrangement of sanitary equipment, as well as the choice of the particular fixtures required for educational institutions, naturally varies considerably with the type and size of the educational building, and also with its locality and cost. Certain features, however, are common to practically all educational institutions.

Toilet Facilities

The location of toilet rooms should be studied as to their best service, and in no case should they be in the basement. There should be toilet rooms for boys and for girls on each floor, on opposite sides of the building. In the grade schools where kindergartens are provided, the toilets should be adjacent to these rooms. There should be toilets in connection with all rest rooms and teachers', nurses', and clinical rooms. In a building several stories high, the toilet rooms should be similarly located above each other on the different floors, to make the piping installation more economical. Toilet-room floors, walls and partitions should be of waterproof materials, and all corners and bases should be curved.

Girls' toilet rooms should have a floor drain, preferably underneath the lavatories, with a loose key type hose cock underneath the lavatory adjoining the floor drain for the purpose of keeping water in the trap seal, and to allow for flushing the toilet room. One compartment in each main toilet room for girls should be of extra size and furnished with a lavatory. Water-closet stalls in the boys' general toilet rooms should have no doors. There should be a loose key hose cock underneath the lavatories, and the floor of the boys' toilet room should be graded to the urinal receptors to serve as floor drain.

Individual water-closets and groups of water-closets should have air chambers to prevent water hammer. The ends of all water-supply runs to lavatories having self-closing faucets should be furnished with an air chamber in a similar manner.

There is a wide divergence of opinion as to the number of plumbing fixtures in general toilet rooms, but the following ratios have been found entirely satisfactory: one water-closet to thirty girls; one water-closet to forty-five boys; one urinal to thirty boys; one lavatory to two girls' water-closets; one lavatory to four boys' water-closets and urinals.

Supply mains should be run exposed, and the lines supplying groups of flushometer valves in connection with water-closets should be over-size to prevent loss in pressure. It is recommended that branch cold-water lines supplying flushometer valves should not supply showers, but that an independent branch line be installed for the showers to prevent loss in pressure, which might seriously affect the water temperature at the shower heads.

Water lines, except standpipe lines and cold-water lines of over 2 inches, should be of copper pipe and fittings. Building officials should insist that architects provide sufficient space for the installation of the various pipe lines to avoid unnecessary offsets. Wherever possible, risers should be installed in accessible shafts of pipe chambers.

Toilet-Room Ventilation

All toilet rooms should be ventilated by the removal of air from the rooms by an exhaust fan having a minimum capacity to give six air changes per hour for each room. No positive air supply need be provided for these toilet rooms, and it is recommended that the doors leading into the rooms be about an inch short at the bottom to allow air to be drawn from the corridors. The toilet exhaust fans should be independent of other exhaust systems.

If there are pipe chambers in back of the water-closets and urinals, it is recommended that there be a small grille at each water-closet stall and near the

urinals, so that the air will be exhausted from the toilet room through the grilles into the pipe space and thence by vertical ducts to the exhaust fan.

If slop-sink rooms are located conveniently to the exhaust ducts, an exhaust grille and duct should be provided from each slop-sink closet.

Soap-Dispensing Equipment

Soap-dispensing equipment is recommended for any medium- or large-size educational institution. Wherever there is a group of lavatories, a liquid-soap dispenser should be installed consisting of a liquid-soap tank, placed in a concealed location if possible, and from this tank a concealed soap dispenser line should be carried to each lavatory, terminating in a push-type soap-dispensing valve immediately above the lavatory. The concealed soap piping from the tank to the valves should be of black iron with black fittings, and the soap-dispensing valves should be of bronze chromium-plated.

Domestic Hot-Water Supply

In the small grade schools, the demand for hot water is very small and is readily met by the installation of a small storage tank having the water heated by a coil heater at the side of the boiler. If hot water is desired in a small school during the non-heating season, it can most easily be provided by a gas heater attached to the storage tank.

In the large high or vocational school having kitchen, showers, and special sinks, the water demand is heavy, and to care for the load a large storage tank or tanks should be provided. Where the extra cost is not prohibitive, it is recommended that the tank be copper-lined or be constructed of corrosion-resistant metal. By properly proportioning the amount of copper water-heating coil in the tank, the water will be heated over a period of hours and thus reduce the load on the heating boilers.

For a summer heater for the large building, a separate boiler is recommended. If heavy grade oil is used as the fuel for the heating boilers, it is recommended that an oil burner using the light grade (No. 2 or No. 3) be installed for the summer heater, and that there be a small oil storage tank inside the building.

In all cases automatic controls should regulate the temperature of the hot water, and the tank should have a spring-type bronze water pressure relief valve and a good make of angle-type thermometer. If the coil heating the water is of the steam type, the coil section should have a vacuum breaker check-valve.

The Plumbing Fixtures

While the selection of the type, form, and class of trimmings of plumbing fixtures will vary according to the engineer's or the building official's particular desires, and somewhat according to the class of school building, the following general features are recommended in connection with the various types of plumbing fixtures.

Water-Closets.—These should be of vitreous china with elongated rim, preferably of the wall-hung blow-out type with concealed flush valve, merely the operating handle projecting through the pipe chamber partition. If water-closets cannot be of this type, they should be of the syphon jet floor type with large trapway. They should have flush valves with stops. The seats should be open front, solid back, no cover, with white metal or composition covered check hinge.

Urinals.—These should be of vitreous china, stall type, 15 inches wide for grade schools and 18 inches wide for high schools, all spaced on 24-inch centers; the space between the urinals filled in a sloping manner with the floor finish, to prevent accumulation of dirt. Urinals should be furnished with an automatic flushing tank having tank and piping placed in pipe chamber where possible.

Lavatories.—Preferably of vitreous china with integral back and concealed wall hangers. Four-ball all-metal indexed self-closing faucets, heavy beaded chain and solid rubber stopper. Supplies to wall to have loose key stops.

Slop-Sinks.—Preferably placed in separate slop-sink closets, of sufficient size to store mops, brooms and other cleaning material. Enameled inside, painted outside. Integral back and roll rim. Rough chromium-plated double mixing compression faucets with rigid spout having hose connection; pail hook to be furnished, with rim guard bolted to sink.

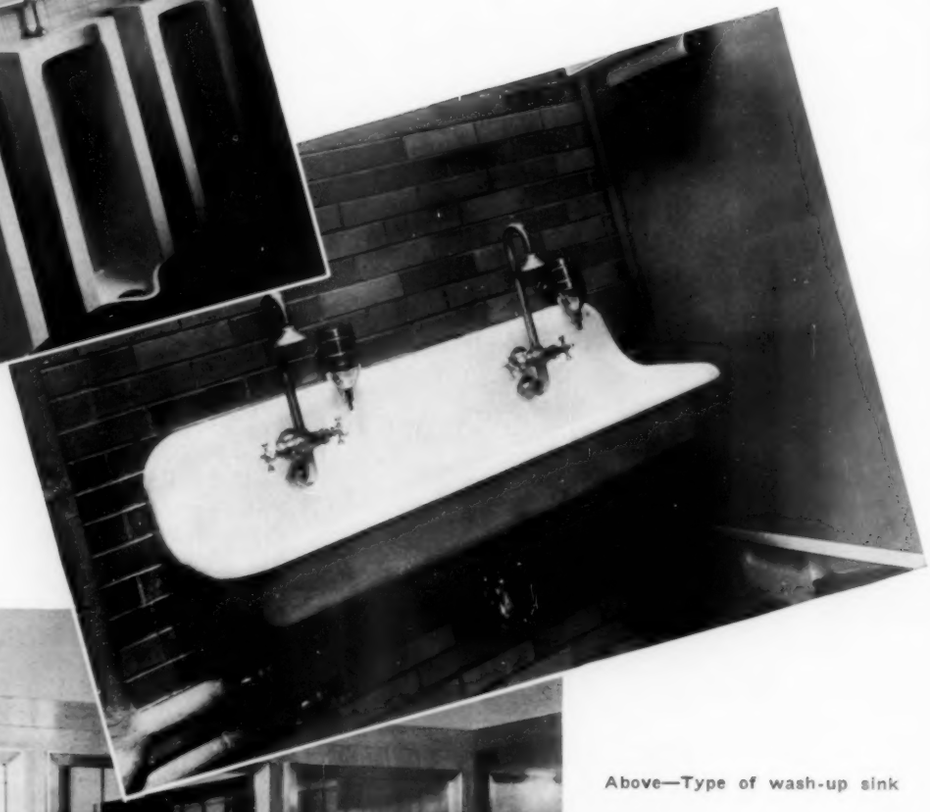
Drinking Fountains.—Placed in convenient corridor locations. Wall type set in deep and wide niches having waterproof wall and floor construction. Vitreous china with concealed fittings. Self-closing valve, with four-pole all-metal handle and stream regulator. Height above floor to rim for elementary grades approximately 30 inches, and 36 inches for high schools.

Gymnasium Fixtures.—The gymnasium should be furnished with a recessed Y. M. C. A. type of drinking fountain and recessed Y. M. C. A. cuspidor, all of vitreous china, of different shape and set at different levels to be so piped that when the drinking fountain is operated it will automatically flush the cuspidor; these fixtures to match the side walls in color.

Showers.—Girls' shower rooms to have individual stalls and receptors with curtain rods and curtains. The supplies preferably to be run exposed over the top of the stalls, using chromium-plated pipes with exposed branches down to the all-metal indexed valves. Shower-heads to be 4-inch non-clogging swivel adjustable type. Water for group showers to be controlled by a master thermostatic mixer having key type control valves and set at least 6 feet 6 inches above the floor. Floor drains in the drying spaces, and lead pans under the showers.

Group showers for boys in the shower room, having a drain gutter extending the full width of the room, equipped with numerous drains to avoid a steep slope in the shower area. Floor finish of non-slip type; curb at entrance to shower room. It is recommended that the shower piping be run concealed and be thoroughly tested under pressure before the side-wall finish is applied. Water temperature control by means of a master thermostatic mixer, as given above for girls' showers. Shower heads of the fixed goose-

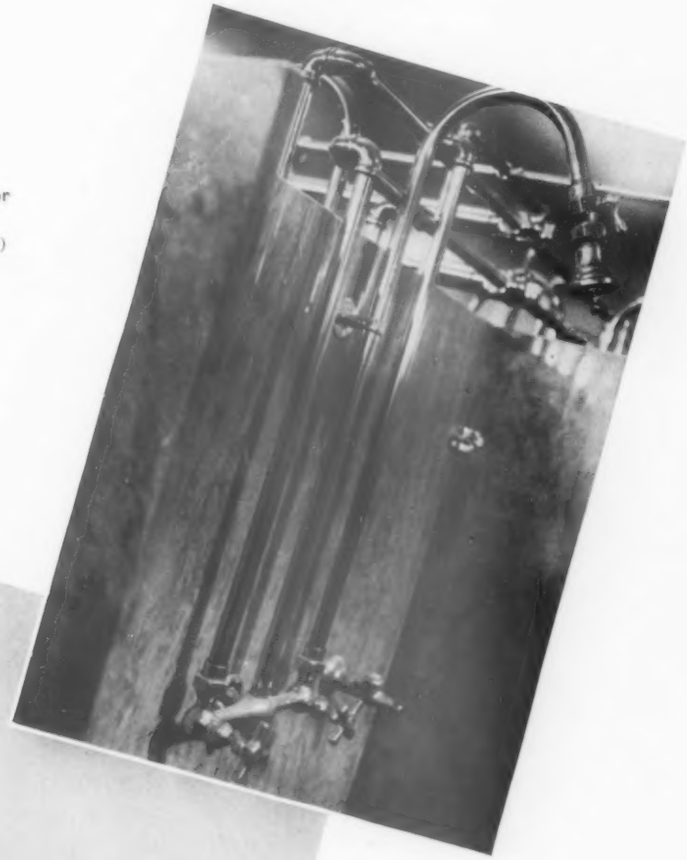
Arrangement of stall urinals and flush tank



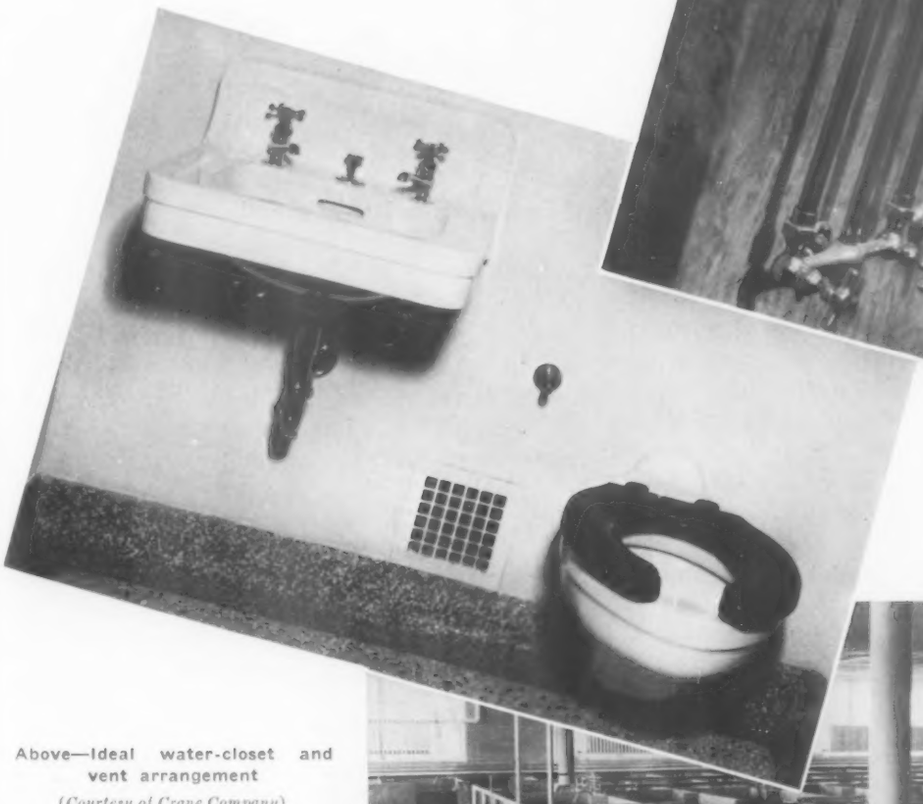
Photographs on this page courtesy of Crane Company

Above—Type of wash-up sink

Left — Ideal arrangement of wash-basins, soap dispensers and mirrors



Layout of exposed piping for shower compartments
(Courtesy of West Disinfecting Company)



Above—Ideal water-closet and vent arrangement
(Courtesy of Crane Company)

Right—Detail of exposed compartments
(Courtesy of West Disinfecting Company)

neck type. Floor drain in the drying space, and lead pans underneath the shower room, providing the room is above the grade floor.

Concealed piping is recommended for individual showers, with a recessed pressure-type water-mixing valve. Adjustable 4-inch non-clogging shower head.

In the larger schools where visiting teams will need locker and shower-room facilities, separate team rooms and locker rooms should be provided to allow the rest of the building to be closed off, to prevent access to any portion of the school other than that used directly by the teams.

Boiler-Room Equipment.—There should be a deep galvanized iron sink in a convenient location in the boiler room, for use by the operating staff and to receive any special drains which are not to be connected directly to the sanitary system. There should be a janitor's toilet room with water-closet and lavatory.

Special Fixtures.—Special sinks, and equipment for kitchen, laboratory and domestic science use, should be provided according to the particular school layout, and of a type to meet the requirements of the department heads. Where domestic science is taught, a model kitchen and a model bathroom should be installed. Each sewing room, art room, typewriting room, mechanical drawing room and shop should have a wash-up sink.

Fixture Venting

Where local rules and regulations require local venting of plumbing fixtures, it will of course be necessary for each fixture to be separately vented. This requirement, however, is usually waived upon request to the local plumbing department in connection with the individual venting of such fixtures as laboratory table sinks, special sinks in instructors' desks, and sinks in connection with domestic science rooms where the equipment does not adjoin a wall. In these particular locations an end vent will usually be satisfactory.*

Where local vents are not required in connection with the plumbing installation, the loop or yoke method of venting will be found satisfactory.

Entrance Water Piping and Reducers

It is important that the street water service line should be of adequate size, particularly in buildings having a large number of toilet flushometer valves. Red brass pipe (iron pipe size) is recommended for the entrance water service line. For large buildings requiring a 4-inch to 6-inch service line, cast iron water pipe of the American Water Works Association Class C standard is recommended.

Should the entrance water pressure be so great that a reduction is desirable, namely, in excess of 40 pounds, this can be done by installing a reducing valve having an extra-large size diaphragm, and also installing a large air chamber ahead of the reducing valve to take up the water surges. Pressure gages should be installed at each side of the reducing valve, and also a full-size three-valve bypass.

* See U. S. Dept. of Commerce "Recommended Minimum Requirements for Plumbing."

For large buildings it is recommended that two smaller-size reducing valves be installed, set at slightly different pressures. This type of installation will give less wear on the valves and closer pressure regulation.

Water Distribution Piping

At the water-meter or pressure-reducing location a water-distributing header should be provided and valved cold-water lines run to the boilers, the hot-water heater, and the several sections of the building. Branches taken from these mains should be valved close to the mains to permit repairs to be made on the branches or to fixtures without shutting off the main. At the hot-water heater a similar header should be provided from which valved mains are to be taken to the various sections of the building. Branches from the hot-water mains should be valved in the same manner as for cold-water branches. When the water mains and branches are installed, they should be so graded that they may be completely drained at the low points when desired. In no case should a cold-water line be placed closer than 6 inches to a hot-water or a hot-water-circulating line.

In the larger school having an accessible unfinished roof space or attic, it is desirable to carry a large hot riser to an attic distributing main and install down-feed hot-water risers. The lower ends of these risers are then connected back to the hot-water tank by circulating lines. Near the ends of mains, make top connections from the mains for the purpose of air elimination. With up-feed hot-water risers, the circulating return line is connected just below the topmost fixture and carried down to the hot-water tank. For the large installation, a return circulating pump is recommended, having the return line equipped with an aquastat to start and stop the motor according to the temperature of the return water.

Gas Piping

Gas piping of black wrought iron should be provided only for specialties requiring it. These include oil-burner ignition, gas hot-water heater, gas plates or ranges, domestic science rooms, laboratories, etc. Gas outlets are not recommended for emergency lighting. Gas lines should be put in with proper provision for drainage and should have drain pockets to catch condensation.

Particular care should be taken with the installation of gas mains and risers to prevent them from being embedded in any concrete or masonry construction, for the settling of any portion of the building may cause the breaking of the pipe or fitting, and escape of gas which cannot be traced, and this situation may necessitate the abandonment of the gas piping system.

Use of vacuum cleaner tool for polished floor, showing inlet valve where hose connects

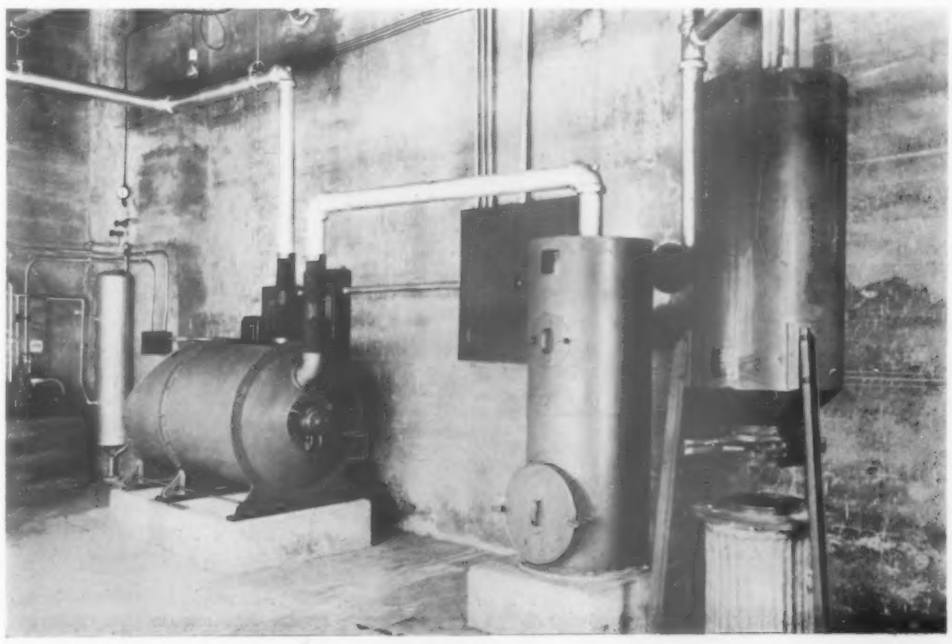
Fire Protection

The installation of automatic sprinklers is recommended for certain portions of any large school building: in all shops, chemical laboratories, physical laboratories, kitchens, basement storage rooms, over the auditorium stage, and in picture booths.

There should be portable 2½-gallon fire extinguishers in recessed cabinets at convenient locations in all corridors, in shops, and at the auditorium stage; also a concealed hose rack with 1½-inch coupled linen hose at each side of the auditorium stage.

Vacuum Cleaning Equipment

It is recommended that in the larger schools a complete vacuum cleaner system be installed, having an outlet in each classroom and special room, and several outlets in the auditorium and gymnasium. There should be convenient closets on each floor for storage of the hose and cleaning tools. The machinery should be located in or adjacent to the boiler room, and there should be an auxiliary soot tank and piping for removal of soot from the fire surfaces of the boilers.



Arrangement of vacuum cleaner and soot tank

Photographs by courtesy of Spencer Turbine Company

AN ANNOTATED BIBLIOGRAPHY ON SCHOOL AND COLLEGE BUILDINGS

BY STANTON LEGGETT

Advanced School Scholar,
Teachers College, Columbia University

I. School Building Programs: Techniques of Planning, Selection of Sites, Relation to City Planning

Location of City School Plants.—By Leland L. Dudley. Harvard Bulletins in Education, No. 14. Harvard University Press, Cambridge, Mass. 1929. 130 pp. $1.00.
Sets up techniques for the selection of school sites.

School Building Programs in American Cities.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1928. 560 pp. $5.00.
Illustrates the application of school-building survey techniques to actual situations distributed over the country.

Planning School Building Programs.—By N. L. Engelhardt and Fred Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1930. 570 pp. $5.00.
Offers essential data and methods of procedure covering most phases of planning school-building programs.

Survey Manual for the Business Administration in Public School Systems.—By N. L. Engelhardt and Fred Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1936. 156 pp. $1.90.
Facilitates appraisal of school-building administration procedures.

Selecting Sites for School Buildings.—By Fred Engelhardt, H. H. Hegel and G. F. Womrath. 1928. 50 pp.
Presents a basis upon which to choose sites for future school buildings.

The Relationship of City Planning to School Plant Planning.—By Russell A. Holy. Bureau of Publications, Teachers College, Columbia University. 1935. 135 pp. $1.60.
A timely study of a very important phase of school planning.

Our Cities Today and Tomorrow.—By T. K. and H. V. Hubbard. Harvard University Press. 1929. 389 pp. $5.00.
Special attention is given to the planning of school provisions in the city of tomorrow.

Neighborhood and Community Planning—The Neighborhood Unit.—By Clarence A. Perry. Regional Plan of New York and its Environs. Vol. VII of the Regional Survey. $3.00. (Out of print.)
The role of the community center school is stressed.

School Building Problems.—By George D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1928. 560 pp. $5.25.
Raises fundamental issues in the field of planning school provisions.

II. Curriculum: Selected Readings that Will, to Some Extent, Indicate the Type of Provision that Must be Made to House the Educational Program of the Future School

The Ideal School.—By B. B. Bogoslovsky. The MacMillan Co., New York. 1936. 525 pp. $2.50.
An interesting picture of the school of the future and the manner in which it might be housed.

Curriculum Development.—By H. L. Caswell and D. S. Campbell. American Book Co., New York. 1935. $2.50.
The continuing revision of the curriculum demands a highly flexible building.

Curriculum Principles and Practices.—By Thomas L. Hopkins. Sanborn Co., New York. 1929. $2.75.
An interesting statement of the changing curriculum that must be considered in planning new buildings.

Integration, its Meaning and Application.—By Thomas L. Hopkins. D. Appleton-Century Co., Inc. New York. 1937. 315 pp. $2.00.
An increasingly important conception in modern education that requires serious consideration in the designing of schools.

Community School.—By Society for Curriculum Study, Committee on the Community School. D. Appleton-Century Co., Inc. 1938. 488 pp. $2.25.
A statement that reflects the growing interest in the interrelationships of community and school.

III. Planning of Buildings, General: Design, Standards, Construction

Functional Planning of Elementary School Buildings.—By Alice P. Barrows. U. S. Office of Education, Bulletin No. 19. Government Printing Office, Washington, D. C. 1936. 83 pp.
Emphasizes the dynamic character of school-building planning. Describes provisions for work in arts and sciences, in play, and in recreation.

Housing of Thirty Public Junior Colleges of the Middle West and Tentative Standards and Principles Relating to Building, Equipment, and Associated Administrative Problems.—By Leo M. Chamberlain. Bulletin of Bureau of School Service, Vol. III, No. 4. University of Kentucky. June, 1931. 210 pp. 50¢.
Develops criteria to be used in designing junior college buildings.

The New World Architecture.—By Sheldon Cheney. Longmans, Green and Co., New York. 1930. 404 pp. $10.00.
A treatment of architectural design that is of value in appraising contemporary American practice.

Modern School Buildings, Elementary and Secondary.—By Sir Felix Clay. (A) B. T. Batsford, Ltd., 94 High Holborn, London, England. Third edition. 1929. 208 pp. $2.55.
Presents the standard English schoolhousing practice.

Grade School Buildings.—By William Conrad and William G. Bruce. Bruce Publishing Co., Milwaukee, Wis. 1925. 400 pp.
Contains descriptions of typical American schools that appeared originally in articles in the *American School Board Journal.*

A Method of Procedure and Checking Schedule for Planning School Buildings and Their Equipment.—By J. J. Donovan. Bruce Publishing Co., 1932. 361 pp. $6.50.
A check list that will prove of help in planning a school building.

School Architecture, Principles and Practices.—By J. J. Donovan and others. The MacMillan Co. 1921. 724 pp. $20.00.
Although old, this volume is still an outstanding source of information on many phases of school planning.

For Better Schoolhouses.—By F. B. Dresslar, S. L. Smith, Haskell Pruett, and others. Interstate School Building Service. George Peabody College. 1929.
A handbook covering the design and construction of rural schools.

Elementary School Building Score Card and Survey Manual.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1936. 48 pp. 50¢.
An aid in the appraisal of elementary schools and a check list to guide the designing of new buildings.

Standards for Junior High School Buildings.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1932. 155 pp. $1.50.
Sets up fundamental criteria that may serve as a point of departure in the planning of new junior high school buildings.

Survey Field Book for the Analysis of a High School Building.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1931. 45 pp. 50¢.
A form that will assist in the analysis of existing high-school plants.

Standards for College Buildings.—By E. S. Evenden, G. D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1938. 226 pp. $2.25.
An outstanding addition to the list of school standards. Will aid in planning the secondary school as parts are applicable to both.

Problems and Practices in Housing the Junior College Program in California.—By C. D. Hardesty. University of California. 1934. 221 pp. $1.50.
Treats the problems arising from housing the junior college with high schools, with special reference to the plant necessary Separate housing is considered desirable and specific recommendations along that line are made.

School Buildings of Today and Tomorrow.—By W. K. Harrison and C. E. Dobbin. Architectural Book Publishing Co., Inc., New York. 1931. 233 pp. $16.50.
An attempt to anticipate the schools of the future. Shows an avenue of development that should be stimulating to the designer of contemporary structures.

Standards for the Evaluation of School Buildings.—By T. C. Holy and W. E. Arnold. Bureau of Educational Research, Ohio State University. Monographs, Number 20. 1936. 79 pp. $1.00.
Treats the common elements of secondary and elementary school plants.

College Architecture in America.—By Charles Klauder and Herbert Wise. Charles Scribner's Sons, New York. 1929. $5.00.
A standard work on the college plant. Devotes many pages to examples of typical college architecture throughout America.

Architectural Planning of the American College.—By Frederick J. Larson and Archie M. Palmer. McGraw-Hill Book Co., New York. 1933. $2.00.
Produced under the auspices of the Association of American Colleges. Covers a wide range of subject matter including details of architectural design, services of the architect, and desirable space provisions.

The Planning and Construction of School Buildings.—The Thirty-Third Yearbook of the National Society for the Study of Education. N. L. Engelhardt, Chairman. Public School Publishing Co., Bloomington, Ill. 1934. 248 pp. $2.50.
A comprehensive treatise covering, in particular, the areas of educational planning and architectural services in connection with school construction.

Report of the Architectural Commission.—Board of Education of the City of New York. 1938. 284 pp.
A vigorous critical appraisal of site selection and building practices in the country's largest city.

Public Elementary School Plant.—By Charles Spain, Arthur Moehlman and Fred Frostic. Rand, McNally and Co., New York. 1930. 602 pp.
Indicates the effect of changing educational policies upon plant requirements.

Campus Standards for Country Day and Boarding Schools.—By George D. Strayer, N. L. Engelhardt and T. C. Burton. Bureau of Publications, Teachers College, Columbia University. 1930. 51 pp. $1.00.
Practically the only work covering this field of school construction.

Standards for Elementary School Buildings.—By George D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1933. 181 pp. $1.60.
Lists fundamental requirements for elementary school buildings as a basis for planning new structures.

Standards for High School Buildings.—By George D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1924. 95 pp. $1.05.
Gives standards to be considered as a basis for differentiation in the planning of school buildings.

Design of Nursery and Elementary Schools.—By H. M. Wright and R. J. Gardner-Medwin. (B) Architectural Press, Ltd., 9 Queen Anne's Gate, Westminster, London, S. W. 1, England.
The beginning of nursery schools in America will be influenced greatly by this text.

IV. Planning of Buildings, Technical Phases: Cost, Legal Details, Plumbing, Ventilation, and the Like

Check List for Public School Building Specifications.—By Lee Byrne. Bureau of Publications, Teachers College, Columbia University. 1931. $2.35.
Analyzes a large number of specifications and suggests areas for improvement.

Equipment Specifications for High Schools: Their Use and Improvement: a New Approach.—By Ray Eugene Cheney. Bureau of Publications, Teachers College, Columbia University. 1934. 87 pp. $1.50.
Recommends a completion form of specification. The bidder is required to supply detailed information about his product beyond the broad, general requirements of the purchaser of equipment.

Variance in Public School Building Bids together with the Legal Effects of Award to Other than the Low Bidder.—By Walter E. Egerman. University of Pittsburgh. 1934.
One of the first studies in the important field of school-building contracts.

Bonding vs. Pay-as-you-go in the Financing of School Buildings.—By Don L. Essex. Bureau of Publications, Teachers College, Columbia University. 1931. 101 pp. $1.50.
Urges a flexible policy depending upon price of bonds.

Rights and Liabilities of Public School Boards under Capital Outlay Contracts.—By Frank E. Henzlik. Bureau of Publications, Teachers College, Columbia University. 1924. $1.50.
Reviews court decisions pertaining to contractual relations involved in school-building projects.

The Influence of the P.W.A. on School Building Construction Costs in New York State.—By Howard T. Herber. Bureau of Publications, Teachers College, Columbia University. 1938.
A scholarly and unbiased research showing the effect of PWA practices on school-building costs.

Practical School Economies.—By Henry H. Linn. Bureau of Publications, Teachers College, Columbia University. 1934. 461 pp. $3.00.
A thoroughly usable book on economies possible through effective administration of the school-building program.

Floor Research (revised, 1937).—James H. Longshore. Continental College of Floor Engineering, Brazil, Ind. 1937. 138 pp. $5.00.
Handbook on structure, treatment, and maintenance of floors. Gives information on most of the problems associated with this area.

The Technique of Estimating School Equipment Costs.—By Arthur K. Loomis. Bureau of Publications, Teachers College, Columbia University. 1926. 112 pp. $1.50.
Develops a technique of estimating costs through use of index numbers based on 1925 prices. Contains typical furniture inventories.

Extra Costs and Incidental Costs in the Erection of School Buildings.—Frank M. Misner. Bureau of Publications, Teachers College, Columbia University. 1934. 79 pp. $1.50.
The check list enables the architect to avoid extra costs that often arise in the construction of school buildings.

Measurement and Interpretation of School Building Utilization.—By Edgar L. Morphet. Bureau of Publications, Teachers College, Columbia University. 1927. 102 pp. $1.60.
Develops techniques of determining the degree to which the school plant is overcrowded.

School Ventilation—Principles and Practices.—New York Commission on Ventilation. Bureau of Publications, Teachers College, Columbia University. 1931. 73 pp. $1.00.
A summary statement of important principles of ventilation derived from years of intensive study under the auspices of the Milbank Memorial Fund.

Safeguarding the School Board's Purchase of Architect's Working Drawings.—By A. M. Proctor. Bureau of Publications, Teachers College, Columbia University. 1931. 138 pp. $2.10.
Analyzes current deficiencies in the purchase of architectural services, and supplies a check list that is intended to aid the school board in avoiding mistakes in this regard.

Courts and Public School Property.—H. H. Punke. University of Chicago Press. 1936. 313 pp. $3.00.
An analysis of court decisions relating to the acquisition, use, and sale of school property.

Some Code Controls of School Building Construction in American Cities.—By John W. Sahlstrom. Bureau of Publications, Teachers College, Columbia University. 1933. $1.50.
Shows the effect of municipal control of school construction, how it may unnecessarily add to cost, and ways in which it may be improved.

Sweet's Catalog File.—Annual. Sweet's Catalog Service, New York.
General reference to manufacturers' products.

Public School Plumbing Equipment.—By Minor W. Thomas. Bureau of Publications, Teachers College, Columbia University. 1928. 128 pp. $1.60.
Details criteria for the selection and arrangement of plumbing facilities in schools.

V. Planning of Special Units

The Social Studies Laboratory, A Study of Equipment and Teaching Aids for the Social Studies.—By James W. Baldwin. Bureau of Publications, Teachers College, Columbia University. 1929. 98 pp. $1.50.
Gives desirable size and equipment of a social studies laboratory which, the author states, should be provided from the fourth to the twelfth grade.

Physical Education Facilities for the Modern Junior and Senior High School.—By Herbert Blair. A. S. Barnes, New York. 1938. 174 pp. $2.50.
An excellent description of desirable space and equipment for physical education work in the public secondary schools.

Building and Equipment for Home Economics.—By Melvin Brodshaug. Bureau of Publications, Teachers College, Columbia University. 1931. $1.75.
A valuable aid in the planning of home economics units.

Furnishings and Equipment for Residence Halls.—By Mary De Garmo Bryan and Etta M. Hanby. Bureau of Publications, Teachers College, Columbia University. 1933. 95 pp. $1.00.
Calls attention to the need for cooperative planning by architect and staff members in providing space and furnishings in residence halls.

The School Cafeteria.—By Mary De Garmo Bryan. F. S. Crofts and Co., New York. 1936. $3.50.
A valuable guide in the development of plans for the school cafeteria.

Some Administrative Problems of the High School Cafeteria.—By Willard S. Ford. Bureau of Publications, Teachers College, Columbia University. 1926. 191 pp. $1.50.
Contains layouts and suggestions as to space requirements of the cafeteria.

The College Library Building; its Planning and Equipment.—By James T. Gerould. Charles Scribner's Sons, New York. 1932. 116 pp. $2.00.
An outstanding work on the desirable facilities for college libraries.

Planning Residence Halls.—By Harriet Hayes. Bureau of Publications, Teachers College, Columbia University. 1932. 247 pp. $2.25.
Desirable space allotments and equipment requirements for residence halls.

Architecture for the New Theatre.—By Edith Juliet Isaacs. Theatre Arts, Inc. 1935. 124 pp. $2.50.
Contains a community theater project by W. H. Lescaze, articles by Norman Bel Geddes and Lee Simson. A really stimulating book in the area of theater and auditorium planning.

Desirable Physical Facilities for an Activity Program.—By Frank Long. Bureau of Publications, Teachers College, Columbia University. 1933. $1.50.
A statement of the type of space and equipment that is needed to house the activity program.

Standards for the Swimming Pool in Educational Institutions.—By Fred W. Luehring. Typewritten copy in the library of Bureau of Publications, Teachers College, Columbia University.
A comprehensive study of the pool, including legal and historical details. Gives standards for space provisions, water-purifying equipment, and information concerning auxiliary rooms.

The New Play Areas.—Edited for the National Recreation Association by George D. Butler. A. S. Barnes and Co., New York. 1938. 242 pp. $3.00.
A thorough revision of an earlier work in this field.

Equipment of the School Theater.—By Milton Smith. Bureau of Publications, Teachers College, Columbia University. 1930. 78 pp. $1.50.
One of the outstanding works on the design and equipment of the school theater. Includes a check list.

VI. Foreign School Buildings

Construction et Amenagement des Ecoles Maternelles.—By Mlle S. Bres. Delgrave, 15, Rue Soufflot, Paris, France. 44 pp.
A description of the design of the French nursery schools.

Escuelas Primarias.—Secretaria De Educacion Publica, Mexico City, Mexico. 1932.
Pictures of the new Mexican buildings.

Scuole.—By Gaetano Minnucci. May be secured through the Architectural Book Publishing Co., New York. 1936.
The most up-to-date treatment of the Italian and European school architecture.

Das Berliner Schulwesen.—By Jens Nydahl. Wiegandt and Grieben, Berlin, Germany. 1928. 607 pp.
Excellent illustrations of modern German schools.

Ecoles.—By Poulain Roger. Vincent Freal et Cie, 4 Rue des Beaux Arts, Paris, France.
Pictures recent development in school construction in France and in Europe.

Edifici Scholastici Italiani, Primari E Secondari.—By Luigi Secchi. Milan, Italy, Ulrico Hoepli. 1927. 228 pp.
Describes Italian school architecture.

Der Neue Schulbau.—By Julius Vischer. Julius Hoffman Verlag, Stuttgart, Germany. 1931. 102 pp.
Treats modern school construction in Europe. It is understood that this volume will shortly be revised.
For English buildings see (A) and (B) under Section III of this bibliography.

VII. Maintenance and Operation

Survey Data Book and Standards for Operation and Maintenance of Physical Plant in Colleges and Universities.—By N. L. Engelhardt, C. E. Reeves and P. West. Mimeographed. Bureau of Publications, Teachers College, Columbia University. 1935. 148 pp. $1.25.

An aid in the evaluating of operation and maintenance of college buildings.

School Building Management.—C. E. Reeves and H. S. Ganders. Bureau of Publications, Teachers College, Columbia University. 1928. 395 pp. $3.75.

A handbook covering the operation and maintenance of school buildings.

Improvement in the Maintenance of Public School Buildings.—By H. M. Schwartz. Bureau of Publications, Teachers College, Columbia University. 1926. $1.50.

Estimates effect of time of repairs upon cost.

Survey Data Book for Public School Janitorial Engineering Service.—By N. L. Engelhardt, C. E. Reeves and G. F. Womrath. Bureau of Publications, Teachers College, Columbia University. 1932. 73 pp. 85¢.

Facilitates appraisal of operation and maintenance of public school plants.

Efficient Business Administration of Public Schools.—By George Womrath. Bruce Publishing Co. 1932. 461 pp. $3.75.

Covers the topics of location, construction, equipment, and operation of school buildings. Chapter on portable schools.

VIII. Bibliographies and Provisions for Keeping up with the Material of the Field

A Bibliography of School Buildings, Grounds, and Equipment.—Bureau of Cooperative Research, Indiana University. Part I, by Henry L. Smith and Leo M. Chamberlain, 326 pp., 1928, 75¢; Part II, by Henry L. Smith and Forest R. Noffsinger, 182 pp., 1933, 50¢; Part III, by Henry L. Smith and Forest R. Noffsinger, 130 pp., 1933, 50¢.

The most comprehensive bibliography in the field. Covers the material well up to 1933.

A Modern Bibliography of School Design.—By Earl F. Sykes. *Architectural Record,* New York. June, 1936. pp. 487-497.

Includes both books and magazine articles. Serves to bring the Smith bibliography up to 1936.

Educational Index under the heading "School Buildings" is an invaluable source of up-to-date material.

Review of Educational Research, Vol. II, No. 5 (December, 1932); Vol. V, No. 4 (October, 1935); and Vol. VIII, No. 4, offers a guide to the research in the field as well as an appraisal of its merits by experts.

National Council on Schoolhouse Construction, *Annual Proceedings,* contains timely articles of great interest.

Magazines often containing articles of interest in the school-building field: *School Executive, The American School Board Journal, The Nation's Schools, Architectural Record, The Architectural Forum, American Architect and Architecture.*

Sweet's Architectural Catalog provides a means of keeping up with the changes in the equipment field.

THE TILE-TEX COMPANY

Plant and General Office Chicago Heights, Illinois

EASTERN SALES OFFICE — 101 Park Avenue, New York City

Grade School, Mattituck, L. I., N. Y.—William LaFon, Architect, Southampton, L. I., N. Y.

TILE-TEX—THE STANDARD ASPHALT TILE FLOOR FOR SCHOOLS

For the past fifteen years, millions of square feet of Tile-Tex have been installed in school houses throughout the United States. These floors are giving uniformly good service, represent on the average a low investment cost per square foot, and are maintained simply and economically. They represent what we honestly believe to be the greatest value in floors for schools that can be purchased today.

Tile-Tex is designed and manufactured to meet the demand for a low cost flooring that will withstand heavy foot traffic under exacting conditions over a long period of years. Prominent school architects specify it consistently and know that the Company manufacturing it can be relied on to stand behind the material and improve it year after year. Hundreds of Tile-Tex school house floors throughout the country are mute testimony to the quality of the product and the knowledge and skill of the Tile-Tex distributors who install it.

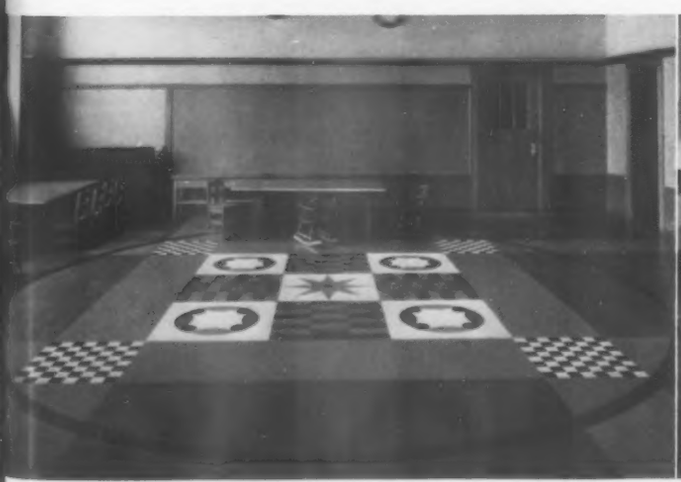
TILE-TEX MEETS THE REQUIREMENTS OF EVERY SCHOOL AREA!

1. ENTRANCE LOBBIES—Striking design possibilities, long-wearing, and non-slip.
2. CORRIDORS—Safe, attractive, easy to maintain, quiet, durable, and economical.
3. CLASSROOMS—Long-wearing, non-distracting to the pupil, easy to keep clean, and suitable for either fixed or movable seating equipment.
4. TOILETS and RESTROOMS—Acid resistant, sanitary, permanent, and easy to clean.
5. AUDITORIUMS—Flexible in design, adapted for ramps and inclines, easy to clean, and durable.
6. LABORATORIES—Acid and alkali resistant, comfortable to stand and walk on, and easy to clean.
7. LIBRARIES — Quiet, comfortable, attractive, and easy to clean.
8. KINDERGARTENS—Safe for children to play on, quiet, adapted to special inserts and game designs, sanitary, and easy to clean.
9. CAFETERIAS and LUNCHROOMS—Easy and inexpensive to maintain, good-looking, long-wearing, and, where necessary, available in Greaseproof colors.
10. OFFICES—Good appearance, durable, quiet, and easy to keep clean.

Tile-Tex is available in four distinct color lines—Economy, Standard, DeLuxe, and Greaseproof—all of the same high quality. The judicious selection of colors to meet the specific requirements of each school area is possible because of these carefully designed color groups. Fifteen sizes and three thicknesses give added flexibility to both design and construction problems.

Laboratory—Cornell Medical College
New York, N. Y.

Office—Southampton Grade School
Southampton, N. Y.



Kindergarten—Monroe School
Monroe, Connecticut

Library—Southampton Grade School
Southampton, N. Y.

Lobby—Riverhead High School
Riverhead, N. Y.

Corridor—St. Mary College & Academy
Monroe, Michigan

Classroom—Riverhead High School
Riverhead, N. Y.

Cafeteria—Harvard University
Cambridge, Massachusetts

PARTIAL LIST OF TILE-TEX SCHOOL INSTALLATIONS

Southampton Grade School, Southampton, Long Island (35,000 ft.)
Wm. LaFon, Architect, Southampton, Long Island
Las Vegas High School, Las Vegas, Nevada (38,000 ft.)
Geo. A. Ferris & Son, Architects, Reno, Nevada
St. Mary College and Academy, Monroe, Michigan (300,000 ft.)
D. A. Bohlen & Son, Architects, Indianapolis, Indiana
Northwestern University, Evanston, Illinois (40,000 ft.)
Belchertown State School, Belchertown, Massachusetts (6,200 ft.)
Kendall, Taylor & Company, Architects, Boston, Massachusetts
University of Mississippi, Oxford, Mississippi
Frank P. Gates Co., Architects, Jackson, Mississippi
Cornell Medical College, New York, N. Y. (110,000 ft.)
Coolidge, Shepley, Bulfinch & Abbott, Architects, Boston, Massachusetts
Berry Schools, Rome, Georgia (30,000 ft.)
University of Wisconsin, Madison, Wisconsin
Arthur Peabody, Architect, Madison, Wisconsin
Clifford B. Connelly School, Pittsburgh, Pennsylvania (50,000 ft.)
Edward B. Lee, Architect, Pittsburgh, Pennsylvania
Louisiana State University, New Orleans, Louisiana (43,000 ft.)
Weis, Dreyfous & Seiferth, Architects, New Orleans, Louisiana
Riverhead High School, Riverhead, Long Island (52,000 ft.)
Wm. LaFon, Architect, Southampton, Long Island
Terrell School, Fort Worth, Texas (22,000 ft.)
Phillips Exeter Academy, Exeter, New Hampshire (20,500 ft.)
Cram & Ferguson, Architects, Boston, Massachusetts
Junior High School, Sidney, Ohio (13,090 sq. ft.)
Loudenbach, Greytag & Loudenbach, Architects, Sidney, Ohio
Matteson High School, Matteson, Illinois (3,000 ft.)
Wainwright & Vaughn, Architects, Hammond, Indiana
Washington State Normal School, Ellensburg, Washington
J. W. Maloney, Architect, Yakima, Washington
New York University, New York, N. Y.
Augustus N. Allen, Architect, New York, N. Y.
Junior High School, Benton Harbor, Michigan (15,200 ft.)
Warren Holmes Company, Architects, Lansing, Michigan
Grade School, Old Lyme, Connecticut (15,000 ft.)
Ernest Sibley, Architect, Litchfield, Connecticut
University of Idaho, Southern Branch, Pocatello, Idaho (20,500 ft.)
Wyandotte County High School, Bethel, Kansas (11,800 ft.)
Peterson & Almon, Architects, Kansas City, Missouri
University of Alabama, Union Building, Tuscaloosa, Alabama (35,000 ft.)
Miller & Martin, Architects, Birmingham, Alabama
Washington Irving School, New York, N. Y. (32,000 ft.)
Board of Education Architect
University of Florida, Gainesville, Florida
Rudolph Weaver, Architect, Gainesville, Florida
Swanton School, Swanton, Ohio
Langdon, Hohly & Gram, Architects, Toledo, Ohio
Ethel Walker School for Girls, Simsbury, Connecticut (45,000 ft.)
St. Vincent DePaul School, Mt. Vernon, Ohio (14,800 ft.)
Glass & Ramsey, Architects, Columbus, Ohio
Calvin College, Grand Rapids, Michigan (10,800 ft.)
Robinson & Campeau, Architects, Grand Rapids, Michigan
Georgetown University Dormitory, Georgetown, D. C. (61,600 ft.)
Emil G. Perrot, Architect, Philadelphia, Pennsylvania
Concordia College, St. Paul, Minnesota (9,850 ft.)
Long & Thorshov, Architects, Minneapolis, Minnesota
Kent State Normal School, Kent, Ohio (15,700 ft.)
T. Ralph Ridley, State Architect, Columbus, Ohio
Morton Grade School, Hastings, Nebraska (29,200 ft.)
M. L. Evans, Architect, Hastings, Nebraska
Harrison Avenue Grade School, Mamaroneck, N. Y. (22,500 ft.)
District School No. 69, Watseka, Illinois (3,000 ft.)
North Junior High School, Joplin, Missouri (12,400 ft.)
T. W. Williamson, Architect, Topeka, Kansas
Brookville School, Brookville, Indiana (12,400 ft.)
Henkel & Hansen, Architects, Connersville, Indiana
University of Tennessee, Memphis, Tennessee
Jones & Furbringer, Architects, Memphis, Tennessee
Bell Skinner Musical Building, Vassar College, Poughkeepsie, N. Y. (3,000 ft.)
Allen, Collens & Willis, Architects, Boston, Massachusetts
Danvers High School, Danvers, Massachusetts (23,500 ft.)
Chas. G. Loring, Architect, Boston, Massachusetts

TILE-TEX WALL TILE—A NEW, LOW-COST WALL TILING—IDEAL FOR CORRIDOR WAINSCOTING

COLORS

A wide range of color, from light pastel shades to rich dark hues, is available.

Practically any decorative scheme is possible. Send for "Decorative Walls by Tile-Tex" which includes complete color charts.

An attractive corridor wainscot of Tile-Tex Wall Tiling

SIZES

Fourteen sizes, from small to large, make possible wall treatments heretofore not attainable with other wall materials.

Sizes are 3x3, 3x6, 4x4, 4½x4½, 4x12, 6x6, 6x12, 6x18, 9x9, 9x18, 9x27, 12x12, 12x24, and 18x24.

Now it is possible for schools to wainscot their corridors with an economical, durable, and attractive tiling which can be applied over existing plaster walls in present buildings, or over smooth plaster backing in new construction.

Toilets, restrooms, and cafeterias are other areas where this new, unique wall surfacing can be used to advantage. It's easily and quickly erected—it can be had in almost any color scheme in both plain and mottled colors—and it's simple and inexpensive to clean.

The cost of Tile-Tex wall tiling applied is considerably less than conventional ceramic tile. If alteration or damage necessitates repairs, it is possible to do so quickly and inexpensively with Tile-Tex wall tiling without muss or fuss. Installation is made by skilled wall covering contractors located throughout the principal cities and towns of the country.

THE TILE-TEX COMPANY
CHICAGO HEIGHTS, ILL.

CONGOLEUM-NAIRN INC.

General Office: Kearny, New Jersey

The finest type of floor for all school areas! That's the established reputation of Nairn Linoleum, which is made by Congoleum-Nairn Inc.—the world's largest producer of smooth-surface floor-covering. In corridor, office, classroom, or gymnasium, Nairn Linoleum provides unique service that makes it first choice in the school field.

Nairn Linoleum is resilient—quiet and comfortable underfoot. It is easy to keep perfectly sanitary—has a smooth surface with no dirt-carrying or dust-generating cracks or joints. Two vital requirements for a school floor!

And think of its economy! In tests made by the National Bureau of Standards, Sealex Battleship Linoleum stood up better than *any* other type of floor. Sealex is moderate in first cost—and gives years of heaviest duty service, with no costly refinishing.

One of the most popular school-floor designs is the beautifully-veined Sealex Veltone Linoleum. A welcome relief from the tiresome geometric patterns so common in resilient floors of the past!

This handsome reception hall greets visitors at a well known university. See how well the Sealex Veltone Linoleum design carries out the modern decorating scheme. A durable, quiet and resilient floor!

Principal's office in a grade school. A dignified floor of Sealex Veltone, "Personal-ized" with Sealex Star Insets and Feature Strip

This Nairn floor in the kindergarten of a modern grade school shows how an individual design can be carried out in Nairn Linoleum

And for school walls—Nairn Wall Linoleum is the same beautiful, washable material as Nairn Linoleum Floors. It provides schools with a permanent fade-proof, crack-proof wall treatment—easy and inexpensive to maintain.

Whether they're used for remodeling or for new construction, Nairn Linoleum Floors and Walls, installed by authorized contractors, carry a guaranty bond covering full value of workmanship and materials.

SCHOOL SUPERINTENDENTS! Write for our new "Resilient Floors" Catalogue and the special booklet, "Sealex Linoleum—The Ideal Floor for All School Areas." Both will be sent without cost or obligation.

●

CONGOLEUM-NAIRN INC.

KEARNY, NEW JERSEY

The ideal gymnasium floor—splinter-proof, germ-free Nairn Linoleum with inlaid game markers in a large high school

THOS. MOULDING FLOOR MFG. CO.

EXECUTIVE OFFICES
165 West Wacker Drive, Chicago, Ill.

ATLANTA, GA., Red Rock Building
DES MOINES, IOWA, Hubbell Building
MINNEAPOLIS, MINN., Thorpe Building
NEW YORK, N. Y., Grand Central Terminal Building
PHILADELPHIA, PA., Architects Building
ST. LOUIS, MO., Chemical Building
DISTRICT SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

THE COMPANY

Thos. Moulding has been in the business of manufacturing and installing floors for over twenty years. The factory, located on the Belt Railroad, Chicago, Ill., is a modern plant with an adequate capacity for both steady and peak demand. It maintains a laboratory, completely equipped for research, and thoroughly tests both raw and finished goods to assure uniformity. **Thos. Moulding Floor Mfg. Co.** and other approved flooring contractors contract to install Moultile anywhere in the United States and nearby countries. Skilled mechanics are employed.

THOS. MOULDING MOULTILE

Reinforced . . . Flexible . . . Master Asphalt Tile

Moultile Asphalt Tile is a highly attractive, durable, resilient floor material, suitable for use as a finished floor over smooth subfloors of all kinds—whether newly laid or existing, of wood or concrete. Individual tiles can be laid in an unlimited variety of patterns and color combinations. Original cost, installation and maintenance are surprisingly low.

Moultile is quiet underfoot, and has a pleasant resilience and elasticity. When dry, unless waxed, Moultile is positively non-slip. When wet, it is less slippery than other smooth-surface floor materials. Moultile is a positive electrical non-conductor, and will not support combustion or ignite from the surface. Moultile is non-absorbent, and will not rot or develop any odor. Proper care with maintenance materials which we supply is easy and inexpensive.

Library, La Salle-Peru Township High School, La Salle, Ill. 50,000 ft. Moultile. ***Childs & Smith, Architects***

Reinforced for Extra Strength and Durability—Special reinforcing materials and processes are employed. Moultile resists impact and abrasion of traffic over a long period of years. It will endure a lifetime. Its surface is not roughened by friction. It has no appreciable coefficient of expansion or contraction to cause curling at joints or buckling. Moultile Reinforced means firmness under the weight of desks, chairs, and other standing loads. Because of its flexibility, Moultile quickly seats itself to the under-floor, permitting immediate use after installation.

Made to Federal Specifications—Moultile is made to Federal Specification No. SS-T-306 which specifies exacting standards of strength, flexibility, size, firmness and thickness.

Ideal for Basement Floors—Moultile can be laid with permanent results over cement resting on the ground. It is affected by neither the alkali nor the dampness ever present in cement floors resting on the ground—solves the problem of floorings over cement on the ground.

Special Types of Moultile—Moultile is made in a number of special types, to suit varying conditions of service. **Moultile "Greaseproof"** may be used in school kitchens, cafeterias, domestic science rooms, etc. **Moultile "Acid-resistant"** is ideal for school laboratories, where chemicals might damage other types of flooring. **Moultile "Prewaxed"**—All types, thicknesses and colors of Moultile are obtainable with a waterproof wax coating burnished right into the tile at factory, highly resistant to soap, water and alkali.

Colors—Approximately 60 plain and marbleized shades in browns, black, blues, white, grays, tans, greens, reds, etc. Special colors on request. Colors are permanently clear in tone, of attractive shades, and not subject to fading or deterioration.

Sizes—Moultile is furnished in ⅛, 3/16, and ¼ in. thicknesses, and in the following sizes: 3x3, 3x6, 4½x4½, 6x6, 6x12, 6x18, 9x9, 9x18, 12x12, 12x24, 18x24 in., and long hexagon.

MOULTILE COVE BASE

Moultile Cove Base is now available to match all colors of Moultile Master Asphalt Tile. It is also suitable for use in conjunction with floorings other than Moultile, such as rubber, linoleum, linoleum tile, etc. Made in various heights, with lip thicknesses to match ⅛", 3/16" or ¼" floor tile.

THOS. MOULDING MOULTILE WALLS

Moultile Wall Tile is an enduring, beautiful, economical wall tile, made from the same type of materials and fabricated by the same process as Thos. Moulding Moultile. Available in eight colors in 3/32 in. thickness, and in the following sizes: 3x3 in., 3x6 in., 4½x4½ in., 6x6 in., 6x12 in., 6x18 in., 9x9 in., 9x12 in., 12x12 in., 12x24 in., and 18x24 in.

THOS. MOULDING NON-SLIP SAFETY TILES

These are standard Moultile Asphalt Tiles with non-slip chips incorporated during the manufacturing process to provide positive, non-slip safety underfoot, even when wet. Can be installed in only a few minutes, and are immediately ready for use. Established levels are not affected.

Colors and Sizes—Available in all Moultile colors. One size only, 12x12 in. Thicknesses, ⅛ in., 3/16 in., and ¼ in.

THOS. MOULDING ASPHALCRETE

Asphalcrete is a cushioned filler for smoothing up bumpy, uneven or poorly troweled cement floors to make a suitable foundation for floor coverings such as asphalt tile, rubber tile, linoleum, etc. It is a successful and economical substitute for cement topping in new construction. Asphalcrete is much cheaper, is resilient and contributes sound deadening qualities not found in cement topping.

Note: Cement subfloors steel troweled to a hard, smooth finish provide a suitable foundation for Moultile without further treatment.

THOS. MOULDING UNDERLAYMENT

Underlayment is a light weight plastic cement which may be laid over rough board underfloors in new construction or over existing wood floors in any condition, to provide a perfect foundation for all types of floor covering—asphalt tile, linoleum, mastic, cork tile, rubber tile, linoleum tile. Underlayment is non-inflammable—materially reduces fire hazard and earns lower insurance rates. It also contributes towards soundproofing wherever used. Thos. Moulding Underlayment corrects defects in old wood floors as follows:

(1) Levels up the uneven wood subfloors.
(2) Flows into the open joints—eliminates possibility of joint lines showing through on finished floor covering.
(3) Underlayment is of such strength that it diminishes the spring of springy boards.
(4) Forms a smooth seamless surface equivalent to a smooth cement floor on which to lay the floor covering.
(5) Will not crumble, buckle, or crack to cause similar defects in finished floor.

Men's Dormitory, University of Colorado, Boulder, Colo. 80,000 ft. Moultile. ***C. Z. Klauder & G. H. Huntington, Architects***

AMERICAN TILE & RUBBER CO.

Trenton, N. J.

Associate of PURITAN RUBBER MANUFACTURING CO.

Manufacturers of

"AMTICO" RUBBER TILE FLOORING — Marble & Terrazzo Effects. "TRENT" RUBBER FLOORING — By the Roll, Plain and Marbleized Colors. "PURITAN" RUBBER MATS & MATTING — Plain & Designed Effects. "PURITAN" RUBBER STAIR TREADS AND NOSINGS

for SCHOOL FLOORS- *weigh well the advantages of* AMTICO *and* TRENT *rubber flooring*

RUBBER FLOOR COVERING AMTICO MARBLEIZED RUBBER TILE

A "Quality" flooring that is unconditionally guaranteed against disintegration or any change in its character. Floors of Amtico Tile laid over ten years ago still retain their original brilliance even under severest wear!

TRENT BRAND

All the worth-while features of Amtico Rubber Tile, but quicker and easier to lay, hence Trent Sheet Rubber is frequently specified for new and old buildings where appropriations are limited!

AMTICO Rubber Tile and TRENT Sheet Rubber Flooring are particularly adapted for school floors. Their dense, sturdy structure provides a quiet, sanitary surface that is easy to keep clean . . . that requires minimum care . . . yet remains bright and sparkling as new through hardest service time and traffic can impose! Available in colors and combinations that meet every decorative demand!

AMTICO Rubber Tile

Three distinct types—58 beautiful colors and combinations: MARBLEIZED—in 18 rich, marble-like variegations; also in 18 new, soft two-tone shades; PLAIN—in 16 brilliant colors; "GRANITE"—in 6 typical granite or terrazzo patterns—in these 58 colors and combinations the entire gamut of decorative embellishment is encompassed! Three thicknesses: 3/32", 3/16", 1/4". Tile sizes: 4" x 4", 6" x 6", 9" x 9", 12" x 12". "Granite" also available 24" x 24".

TRENT Sheet Rubber

Available in a variety of Marbleized and Plain colors that harmonize with any background. Same attractive appearance . . . same "decorator" effects . . . same sturdy resistance to wear that has made rubber flooring the choice of leading schools and universities! Two thicknesses: 1/8" and 3/16"—in rolls of approx. 25 yards. Easier to cut and fit—TRENT Sheet Rubber is particularly adapted for school floors where durability and charm are desired and appropriations are limited.

Write for catalogue showing installations in colors

TRENT *rubber* **WALL Covering**

Provides for walls and wainscotings, the same fadeless, sanitary surface — the same rich colorings — the same fabric backing as Trent Flooring — but only 1/16" gauge. New—smart—easy to apply.

Write for samples and information

RUBBER *mats and runners*

We supply to order, everything in rubber floor coverings: Mats—any size—any shape—with or without name or special designs—in colors to suit. Stair Treads and Corrugated Roll Matting. Write for details and prices.

Special Sizes Made to Order

OUR ADVISORY DEPARTMENT IS AT YOUR SERVICE — ALWAYS

We will welcome the opportunity of cooperating with school architects, principals or purchasing agents in planning, designing and laying out floors of special design to meet the requirements of any room, office, corridor or auditorium. Estimates and counsel are yours for the asking.

THE GOODYEAR TIRE & RUBBER COMPANY, INC.

Akron, Ohio · · Los Angeles, Calif.

Typical Goodyear Rubber Flooring Installations

GOODYEAR WINGFOOT RUBBER FLOORING and WALL RUBBER

ARE PREFERRED IN BUILDING AND REMODELING FOR THESE SOUND REASONS

GOODYEAR WINGFOOT RUBBER FLOORING

The permanent beauty and wide variety of its rich colors and combinations harmonize with any interior plan.

The fresh, handsome appearance of its smooth, resilient surface is easily retained by occasional damp moppings.

A fabric insert in every piece diffuses traffic shock, protects the adhesive and prevents creeping, buckling and stretching.

Because of its resilient surface, it is always comfortable and quiet underfoot.

Its beauty is not permanently marred by alcohol, smoke, cigarette burns, inks, or even most acids. Ideal for laboratories.

It is so durable that it frequently outlasts buildings in which it is installed.

Available in Two Types

GOODYEAR WINGFOOT SHEET RUBBER FLOORING—comes in continuous rolls, costs less and is especially suitable for large schoolroom floors.

GOODYEAR WINGFOOT RUBBER TILE FLOORING—is manufactured in individual blocks of specified size, thickness, shape and colors. The essential difference between the two types is that of form alone.

GOODYEAR WINGFOOT WALL RUBBER

Wingfoot Wall Rubber provides permanent walls of enduring beauty—easily maintained.

For complete specifications, see Sweet's Architectural Catalog

THE GREATEST NAME IN RUBBER

GOODYEAR

SERVICISED PRODUCTS CORPORATION

Manufacturers and Distributors

MAIN FACTORY — Chicago 6051 West 65th St., Chicago, Ill. BRANCHES IN PRINCIPAL CITIES

WHEN you are considering materials for school construction, remember that Servicised Quality products are giving exceptional service in this field. Continuous development of better products has won for **"Servicised"** leadership in the application of plastic, elastic and waterproofing materials to better building.

SERVICISED PRODUCTS FOR SCHOOLS

Asphalt Expansion Joints
Cork Expansion Joints
Cork-Rubber Expansion Joints
Sponge-Rubber Expansion Joints
Asphalt Plank Flooring—Plain, Rock-Surfaced and Armored
Asphalt Roof Decking
Rubberlok Interlocking Rubber Flooring
Cork-Rubber Tile
Rubber Tile Flagging
Safety Stair Treads
Waterproofing Materials
Asphalt Floor Tile

RUBBERLOK RUBBER FLOORING

RUBBERLOK Rubber Flooring is making architectural history. It has revolutionized all previous standards of laying and maintaining rubber floors. Rubberlok gives color and comfort and cuts cost of installation.

It makes a beautiful, resilient floor which cannot warp, curl, creep nor crack—and can be easily laid by any handy man at one-quarter the cost of installing single tile.

Rubberlok Rubber Flooring is made in 10 ft. strips which can be laid to make an impervious floor

The accurate tongue-and-groove joint shown in upper right corner ensures a perfect-fitting floor covering

The unique feature of Rubberlok is that it comes in 10-foot slabs, tongued and grooved on sides and ends for tight and interlocked matching. The pattern blocks are held together by a flexible stock which acts as an expansion joint between blocks. It cannot be laid wrong since it fits together so easily and accurately. Rubberlok is not merely a floor covering but a floor in itself.

A variety of non-fading colors and a wide range of patterns, both mottled and solid, are available. Slabs are furnished in 6″, 9″, and 12″ widths, 10 feet long and 3/16″ or 1/4″ thick.

Rubberlok is recommended as economical and pleasing for any public room. We shall be glad to send you a special detailed folder and color chart on Rubberlok, the rubber flooring innovation.

RUBBER FLAGSTONE TILE

Brilliant in appearance, pleasing in design and color combinations, Servicised Rubber and Cork Rubber Flagstone Tile is rapidly coming into vogue for service floors which must be durable as well as attractive.

This flagging is usually laid in lobbies, reception rooms and entrance halls but it is equally adaptable to any floor space in the building. It has a distinctive and "livable" personality all its own and, in addition, provides a durable, easily-cleaned floor which is restful under-foot.

Rubber Flagstone Tile

SERVICISED RUBBER SAFETY TREAD

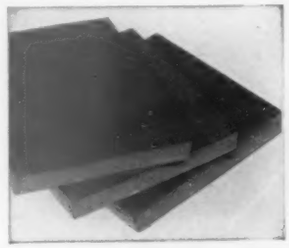
This is a recently developed Servicised product, far in advance of similar treads available at retail stores. It is a carefully moulded and cured product, made of finest pure para rubber. Easily installed, these treads give long and reliable service without cracking or peeling, and with high resistance to abrasion, oil, acids and moisture.

A real quality rubber stair tread that will stand the "gaff"

CORK-RUBBER TILE

Over a period of three years, Servicised engineers have checked up on Servicised Cork-Rubber Tile, both in actual service and in the laboratories. Their findings are conclusive: this new Servicised product meets all requirements for an ideal, silencing, resilient flooring material.

Its advantages: (1) High dirt resistance; (2) Flexible, conforming to minor variations of base without breakage; (3) Resists indentations and scratches; (4) Impervious to air, water and acids; (5) Light, yet very strong; (6) Lasting Beauty.



Cork-Rubber Type Flagstone Tile

Servicised Cork-Rubber Tile is a great improvement over cork flooring with a resin binder. It will give better service and deserves consideration for vestibules, corridors, gymnasium floors, libraries, infirmaries, etc.

Detailed Bulletins on these specialized flooring products will be furnished promptly at your request.

Use SERVICISED materials for tile installation work. SERVICISED underlayment to cover wood floors unsuited to saturated felt. SERVICISED asphalt primer or binder for smoothing uneven and rough concrete.

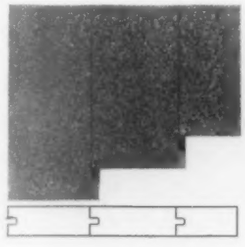
CORK RUBBER TONGUE AND GROOVE BOARD

Cork Rubber Tongue and Groove Board is a flooring board compounded of live rubber and ground cork. It is layed over inexpensive wood sub-floor, and produces an attractive, resilient, non-slippery, noiseless and easy tread flooring, assisting greatly in acoustical efficiency.

In color it has a slight random effect and can be had in dark or natural colors with standard thickness of 3/4″ x 3 1/8″ width; greater widths can also be furnished.

The installation of Cork Rubber Tongue and Groove Board is very simple. Over the ordinary sub-floor, is applied a 15-lb. felt paper. The Board is then applied, the same as Tongue and Grooved Lumber, plus a cement made for this purpose.

If a board flooring effect is desired, silence, soft tread under foot, semi-acoustical treatment, consider Rubber Cork Board as an outstanding item. The toughness and long life are also outstanding features. The artistic beauty and its soft natural and dark shade, blend in with any desired decorative color scheme.



THE JENNISON-WRIGHT COMPANY

Toledo, Ohio

BRANCHES IN ALL LARGE CITIES

Kreolite Separate Wood Block Floors serve in the school and educational institution no less than in the factory and work shop where today their use is so general as to reveal Kreolite as the national choice for heavy-duty service.

Especially is Kreolite specified for all departments where mechanical operations are carried on. Tools are not damaged when they are dropped, for the Kreolite floor is resilient. The floor is not damaged because wear and accident leave no appreciable impression upon the tough end grain surface of the specially treated selected wood blocks.

Among the scores of leading educational institutions now enjoying the economy and benefit of Kreolite Wood Block Floors are: East Tech. High School, Cleveland, Ohio; Jefferson High School, Los Angeles, Calif.; Lindbloom High School, Chicago, Ill.; University of Michigan, Ann Arbor, Mich.; Purdue University, Lafayette, Ind.; Technical High School, Indianapolis, Ind.; University of Illinois, Urbana, Ill.; University of Wisconsin, Madison, Wisc.; Yale University, New Haven, Conn.

Write for complete information

KREOLITE

WOOD BLOCK FLOORING

Kreolite Wood Block Floors Used in Over 135 Schools!

Kreolite Flexible Strip End Grain Wood Block Floor in the Gymnasium of the New York State Vocational Institution, West Coxsackie, New York

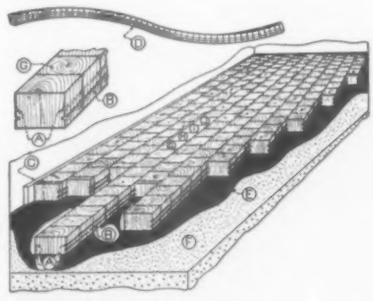
One of the many Kreolite gymnasium floors giving maximum of resilience, safety, appearance, wear, non-slipping, and all around satisfaction as to its ability to successfully withstand gymnasium play of all kinds.

The value of Kreolite Flexible Strip End Grain Wood Block Flooring is recognized instantly by the modern architect of schools and public buildings. They cannot become loose in the floor. The durability is practically limitless as the strips are laid with the tough end-grain of the individual blocks uppermost. The light natural color and beauty of the wood are retained, although the blocks are treated with a transparent, waterproof preservative.

Complete Information Sent on Request

(a)—Metal wire truss binding the individual blocks into a compact, solid monolithic-like end-grain plank or strip.

(b)—Metal spline binding the individual strips together.



(c)—Cork expansion joint laid flush with the surface of the floor.

(d)—Flexibility—can be laid over wood sub-floor, in mill type buildings.

(e)—Waterproof membrane between concrete and strips.

(f)—Smooth finish concrete foundation.

(g)—Surface sanded smooth.

(h)—Manufactured from properly dried yellow pine or fir.

(i)—Treated with a transparent, odorless, waterproofing preservative so that the natural light color of the wood is maintained. The surface of the floor may be waxed and highly polished if desired, presenting a most pleasing and beautiful design.

(j)—Laid with the tough end-grain up. End-grain blocks run full depth of strips, from top to bottom, each block being anchored to the base, in a bed of mastic.

Kreolite Wood Block Floors Used in Over 150 Schools!

WRIGHT RUBBER PRODUCTS CO.

P. O. Box 696, Racine, Wisconsin

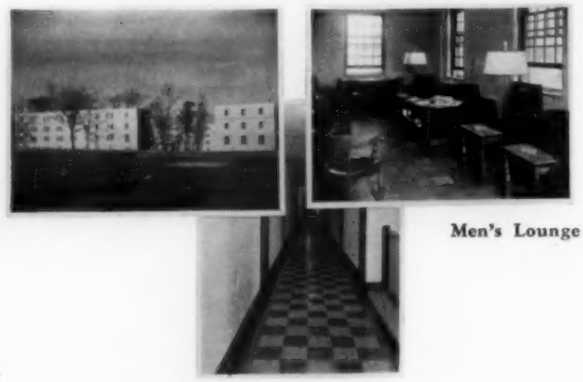
CHICAGO WHOLESALE OFFICE—13113 Merchandise Mart

1922 ★ ★ ★ 1939

W R I G H T E X

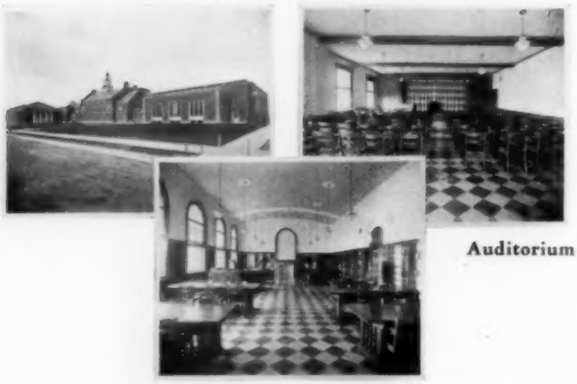
The Quality Rubber Tile Floor

The Modern Floor for Corridors, Class Rooms, Chapel, Office, Library and Dormitories in Universities, Colleges, High or Grade Schools



Men's Lounge

Corridor
Eight Dormitory Buildings
University of Wisconsin, Madison
75,000 Square Feet



Auditorium

Library
Menasha High School, Menasha, Wisconsin

Browsing Room

Reading Room
Chapman Memorial Library, Milwaukee Downer College, Milwaukee, Wisconsin

QUIET and comfortable underfoot. The din of hundreds of hurrying feet on hard floors is extremely nerve racking.

■

BEAUTIFUL colors easy to create into attractive and practical designs to harmonize with interior decorating schemes.

■

DURABLE Wrightex floors are long wearing, easily and economically maintained.

Interesting animal insets for the primary age class rooms and special designs for entrances and corridors. Wrightex floors are highly fire and stain resistant and should a tile or two become damaged by accident, they can be replaced.

■

Write for complete information

●

MAPLE FLOORING MANUFACTURERS ASSOCIATION

332 South Michigan Avenue, Chicago, Ill.

Floor *with* Maple

In Class Rooms, Assembly Halls, Shops and Gymnasiums

PRODUCTS

MFMA trademarked Northern Hard Maple, Beech and Birch Floorings, standardized and guaranteed as to grade and manufacture.

QUALITIES

Northern Hard Maple—a tight grained, hard fibered wood—has the school-room floor essential qualities of long wear, smoothness, cleanliness and foot comfort. Economical in installation and maintenance cost. Provides firm anchorage for desks, facilitates alterations.

GOOD SERVICE FINISHES

Service finishes that seal the surface of Hard Maple, keep out dirt, resist soil stains, prove non-slippery—now available. Will not mar, scratch or flake off. Easy to clean and economical to maintain.

GRADING RULES

MFMA Northern Hard Maple, Beech and Birch Floorings are kiln-dried, sold in standard grades, described in detail in a book of Grading Rules, available on application.

Standard lengths, 25/32 inch and thicker strip flooring as follows:

MFMA First Grade: 2 to 16 feet, may contain up to 25% of 2 to 3½ feet, inclusive.

MFMA Second Grade: 1½ to 16 feet, may contain up to 40% of 1½ to 3½ feet, inclusive.

MFMA Third Grade: 1 to 16 feet, may contain up to 60% of 1 to 3½ feet, inclusive.

Hard Maple Floor in Foster School, Evanston, Illinois, 35 years old, reconditioned with Heavy-Duty finish — floor previously scrubbed — no treatment

STANDARD MEASUREMENT

Flooring ½ inch and thicker, all faces, is measured ¼-inch waste for matching.

Flooring ⅜ inch (11/32-inch) thick, all faces, is measured ½-inch waste for matching.

Jointed flooring, all thicknesses and faces, is measured ½-inch waste.

STANDARDIZATION

MFMA flooring is made to accurate specifications standardized by the Association. The Association maintains supervision over the products of its members through regular grade inspection at mills and its re-inspection service. Competent inspectors are employed for this purpose.

PATTERNS

You can lay Maple in strips or blocks—with or without pattern—over screeds, wood or concrete subfloors.

THICKNESSES AND FACES

Popular sizes of Hard Maple strip flooring are 25/32″, 33/32″ and 41/32″ thicknesses in the 1½″ (25/32″ only), 2″, 2¼″ and 3¼″ face widths.

Hard Maple block flooring, cut to exact, uniform lengths, in 25/32″ and 33/32″ thicknesses, is available in individual blocks and in fabricated squares or rectangles.

LITERATURE FOR FREE DISTRIBUTION

The following booklets and folders are offered through the office of the Association, and will gladly be mailed on request, free of charge:

"**MFMA** Grading Rules and Standard Specifications, including other data of value to Architects—issued in filing pocket folder of A.I.A. file size" (May, 1935, edition).

"Heavy Duty Finishes for Maple Flooring—**MFMA** Approved."

"Grading Rules for **MFMA** Floorings—pocket size."

"Hard Maple Flooring"—a folder containing reproductions of the product.

Laying Hard Maple Block Flooring in the University of Minnesota Indoor Sports Building

Let our Service and Research Department assist you with your flooring problems. Write us

AMERICAN MASON SAFETY TREAD CO.

GENERAL OFFICE AND FACTORY

Lowell, Mass.

Description: A metal plate of Iron, Bronze or Aluminum impregnated with abrasive grains or flint-like particles projecting above the surface, presents a Non-Slip stair tread both durable and safe under all conditions.

Application: Stair treads and platforms for new or old construction, ramps, door and elevator saddles, floor plates, trench covers, and spiral stair treads.

Assistance: Solution of stair and slipping hazard problems gladly suggested.

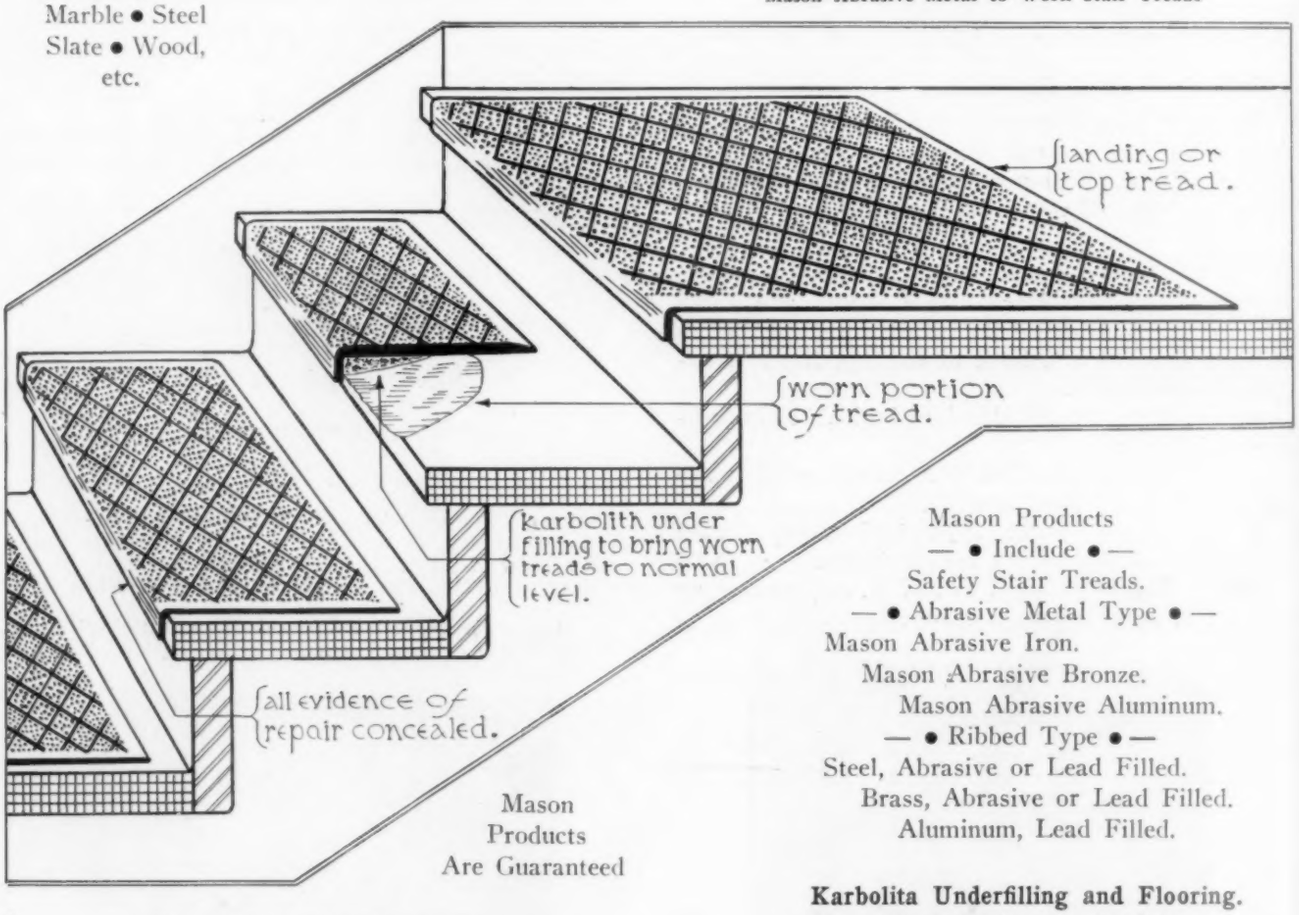
Advantages: Painful accidents on new or worn stairs can be prevented economically by application of Mason Abrasive Iron or Mason Ribbed Type Safety Treads.

Mason Safety Treads are used by Educational and Religious Institutions, in Public Terminals, and Industrial Plants, etc.

Mason Safety Treads are recommended by leading Architects, Safety Engineers and Insurance Companies.

Suitable for Marble • Steel Slate • Wood, etc.

Recommended Method of Applying Mason Abrasive Metal to Worn Stair Treads


landing or top tread.
worn portion of tread.
karbolith under filling to bring worn treads to normal level.
all evidence of repair concealed.

Mason Products Are Guaranteed

Mason Products
— • Include • —
Safety Stair Treads.
— • Abrasive Metal Type • —
Mason Abrasive Iron.
Mason Abrasive Bronze.
Mason Abrasive Aluminum.
— • Ribbed Type • —
Steel, Abrasive or Lead Filled.
Brass, Abrasive or Lead Filled.
Aluminum, Lead Filled.

Karbolita Underfilling and Flooring.
Mason Stair Nosings and Edgings.
Mason Safety Ladder Shoes.
Mason Extruded Thresholds.

The oldest nationally known safety tread manufacturer in the United States. Catalogue and Samples Supplied without obligation

· · · AGENTS IN PRINCIPAL CITIES · · ·

AMERICAN ABRASIVE METALS CO.

Irvington, New Jersey

NEW YORK OFFICE: 50 Church Street CHICAGO OFFICE: 111 W. Washington Street

AGENTS IN

BOSTON LOS ANGELES PITTSBURGH
ST. LOUIS PHILADELPHIA SAN FRANCISCO

For 25 years

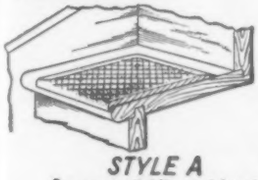
THE TREAD OF SAFETY AND ECONOMY

FERALUN Treads prevent slipping accidents on stairs and eliminate repair bills and further maintenance cost. In the Washington Irving High School, N. Y. C., Feralun Treads were installed 25 years ago; since then no accidents have been reported nor repairs required. Over 1900 schools, within a period of five years, were equipped with FERALUN, a record unequalled in the safety tread field.

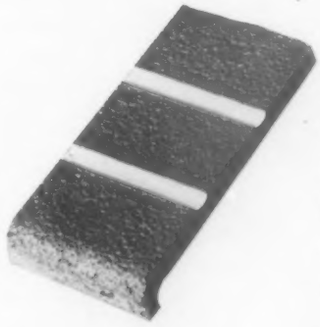
FERALUN is an iron base, in the surface of which is imbedded abrasive material, assuring you a safe footing under any conditions. The abrasive is carried down over the nosing edge, the point of most accidents.

FERALUN for Repairs. FERALUN is easily applied and comes to you with holes drilled, ready for convenient installation. The illustration shows how they are superimposed on existing treads of wood, slate, cement, marble, or iron. Where existing treads are worn and hollowed out, they are first filled in with cement and the FERALUN is attached with either wood screws or expansion shields.

STYLE A long lip
for worn wood or marble treads maximum depth of lip 2" from underside of tread.



STYLE A
for new or slightly used treads

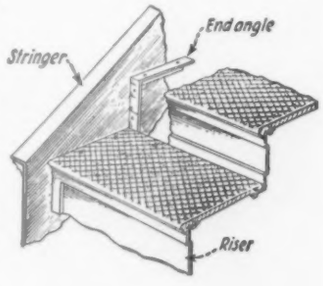


ENAMALUN

A FERALUN Tread with red or orange visibility flutes. Greatly enhancing the appearance and a marker to distinguish the nosing edge.

BRONZALUN or **ALUMINUM** — the same as FERALUN except for the metals—is frequently used in main stairways.

FERALUN for New Construction. At the right is illustrated a tread especially designed for schools. Its wide acceptance is due to its simplicity of erection, its non-slip qualities, and long wear.



We have prepared an interesting leaflet on stairway requirements in schools which we shall be glad to send you upon request.

Write for samples and catalogues

WOOSTER PRODUCTS INC.

Wooster, Ohio

NEW YORK OFFICE: 101 Park Ave. CHICAGO OFFICE: 2215 W. 110th Place

REPRESENTATIVES IN ALL PRINCIPAL CITIES

WOOSTER SAFE-GROOVE TREADS

Steel Base, Yellow Brass Base, White Alloy Base

WOOSTER ABRASIVE CAST TREADS

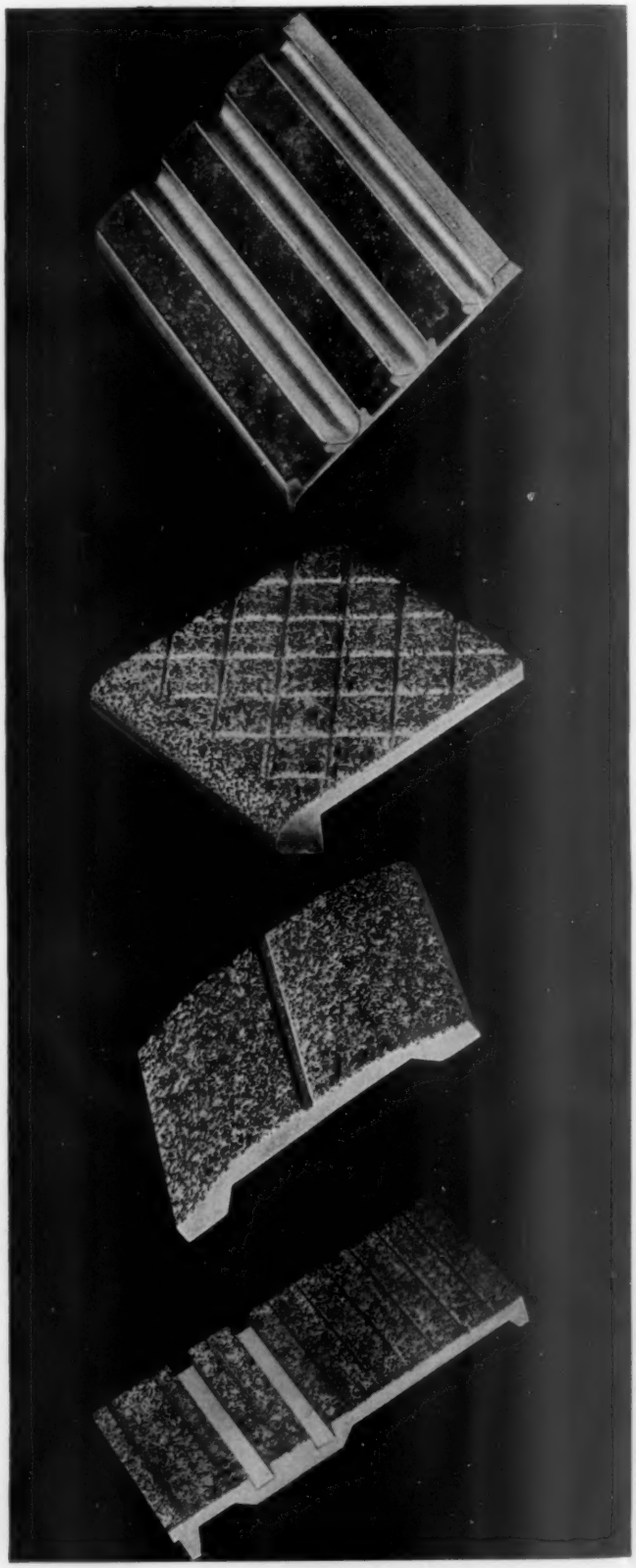
Ferrogrit, Alumogrit, Bronzogrit, Nicklogrit

Wooster Safety Treads prevent falls through slipping on stairs. On new or old stairs they provide a maximum degree of safety. On new stairs they reduce maintenance costs to a minimum by preventing wear and tear which makes steps dangerously hollowed out, smooth and slippery. Once installed, the treads last for years under hard and constant usage. And, if they ever do wear out, are easily and economically replaced.

For easy, economical repair of present stairs, they are unsurpassed. Easily and quickly installed on steps of any material.

Wooster Safe-Groove Treads are made with alternate ribs of anti-slip material and deep safe grooves. Made in three different metals, steel base, yellow brass base and white alloy base, and the ribs of anti-slip may be either abrasive grits or lead.

Wooster Abrasive Cast Treads are cast metal treads with grains of abrasive grits cast right into the metal with sharp points projecting above the walking surface, thus providing utmost anti-slip effectiveness. They are made in four different metals, cast iron, cast aluminum, cast bronze and cast nickel bronze, and are sold under the trade names of Ferrogrit, Alumogrit, Bronzogrit and Nicklogrit.



WOOSTER METAL MOULDINGS

Wooster produces two complete and comprehensive lines of metal mouldings for use with wall and floor covering materials such as Linoleum, Rubber or Asbestos Tile, Plywoods, or Hardboards. Highly decorative; easily installed with either flexible or rigid materials. On walls or floors, these mouldings enhance the appearance of any materials with which they are used. And, in addition to their decorative qualities, they provide utmost protection for the edges of the materials, prolonging their life and attractiveness.

Wooster Metal Mouldings are made in solid, extruded, heat-treated aluminum alloy, Stainless Steel, or Yellow Brass, and are furnished in three standard finishes.

They are widely used in the construction of Sink, Desk, Table or Counter Tops. And, because of their fine quality are recommended and endorsed by most nationally-known manufacturers of wall and floor covering materials. All Wooster Moulding sections are produced in attractive shapes, a wide variety of sizes and are adapted to use with practically all materials and greatly facilitate installation.

Illustrated Price Lists, Circulars and Samples gladly sent upon request

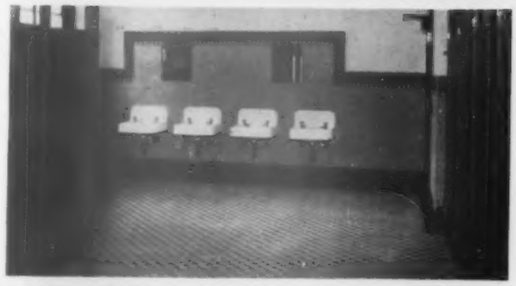
THE MOSAIC TILE COMPANY

Main Office Zanesville, Ohio Factory

MOSAIC

New York Chicago Washington Detroit Los Angeles San Francisco

TILE as a finishing material in school construction is assuming a position of new importance. The intelligent application of color in a material possessing durability and sanitary qualities can easily be accomplished through the proper use of tile. Every kind of tile cannot be recommended for all purposes; there is a different type to meet different requirements. Mozane bright enamel wall tile, for example, cannot be excelled for wainscoting in corridors where easy maintenance and maximum efficiency of available light are important factors. The high enamel finish discourages abuse from marking with pencil or other articles. At the same time it possesses a high light reflecting capacity which serves to intensify the quality of the color and yet allows little light absorption. Granitex mosaics with glazed faience enrichments, unglazed ceramic mosaics, Satin Matt wall tile, hand decorated faience inserts and borders in kindergarten or athletic subjects, all have no end of possibilities for interesting adaptations to wainscoting, stair treads and risers, floors, fountains, swimming pools, mantels and toilet rooms. Literature and samples upon request.



Upper Right
Nashua High School, Nashua, N. H.
Wells, Hudson and Granger, Architects

Right Center
Nashua High School, Nashua, N. H.
Wells, Hudson and Granger, Architects

Lower Right
Menasha High School, Menasha, Wisconsin
Foeller, Schober and Berners, Architects

Lower Left
Thomas Street School, Lansing, Michigan
Warren S. Holmes Company, Architects

THE NATIONAL TERRAZZO and MOSAIC ASSOCIATION

1406 G Street NW, Washington, D. C.

Classic dignity marks this Terrazzo floor in the entrance hall of the Elementary School at Haines St. and Ogontz Avenue, Philadelphia, Pennsylvania

YOUR OWN DESIGNS *at no extra cost*

LOVELY TO LOOK AT—easier to clean—practically impossible to wear out. That's Terrazzo, the modern school flooring. Terrazzo is usually mixed on the job. This gives almost unlimited scope for color and design so that you may have your own pattern and be sure the finished job will be exactly as you wished it. In that way, hallways, lobbies, classrooms or laboratories can be made to harmonize with a whole building, or, by designing a map or school seal, express the individuality of the school that uses them.

What is Terrazzo? Terrazzo is made with marble chips, portland cement and water, plus mineral color pigment where desired, and separated by dividing strips to guard against cracking it. It is dense, hard concrete, ideal for office building and institution floors that must stand the heavy, daily pounding of hurrying feet.

Where is it used? Terrazzo is a favorite with American schools. It is recommended for entrances, corridors, classrooms, offices, laboratories and such installations as swimming pools, etc. . . . Terrazzo may also be precast for special shapes, and placed in units. This makes possible its use for wainscoting, stairs and cornices.

Does it require much maintenance? Almost none! Routine washing and mopping, plus polishing at occasional intervals keeps a terrazzo floor in excellent condition. It is highly stain-resistant, and practically mar-proof, even under severe wear.

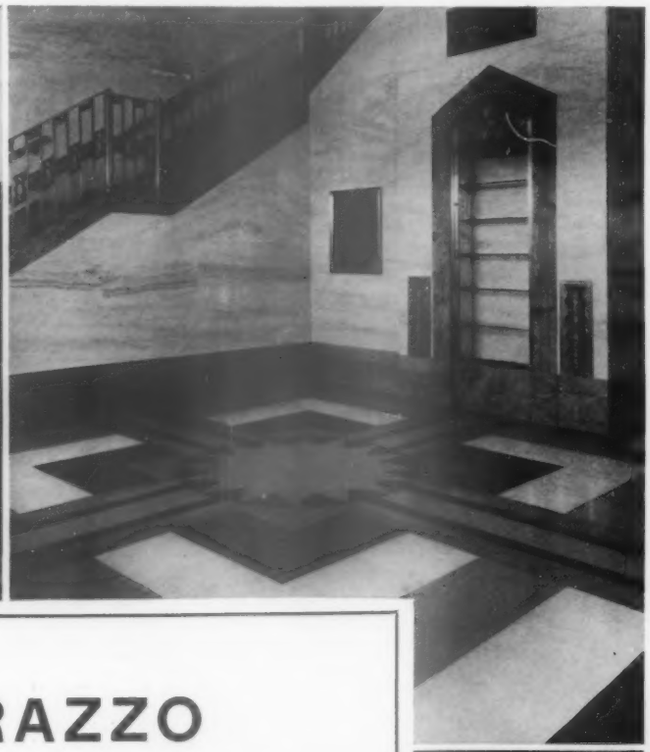
To sum up, with a Terrazzo floor you get: (1) colorful beauty, (2) flexible design, (3) permanence and durability, (4) economy and low maintenance cost. School floors must be durable but they need not be drab. Make them bright and colorful with a floor that will last—a terrazzo floor. Detailed information and complete specifications will be sent promptly upon request.

A Buyers Service for School Executives

● **The National Terrazzo and Mosaic Association, Inc., maintains an office located at 1406 G Street, NW, Washington, D. C., to which school executives and architects can turn for authentic information on terrazzo. Your questions will be gladly answered**

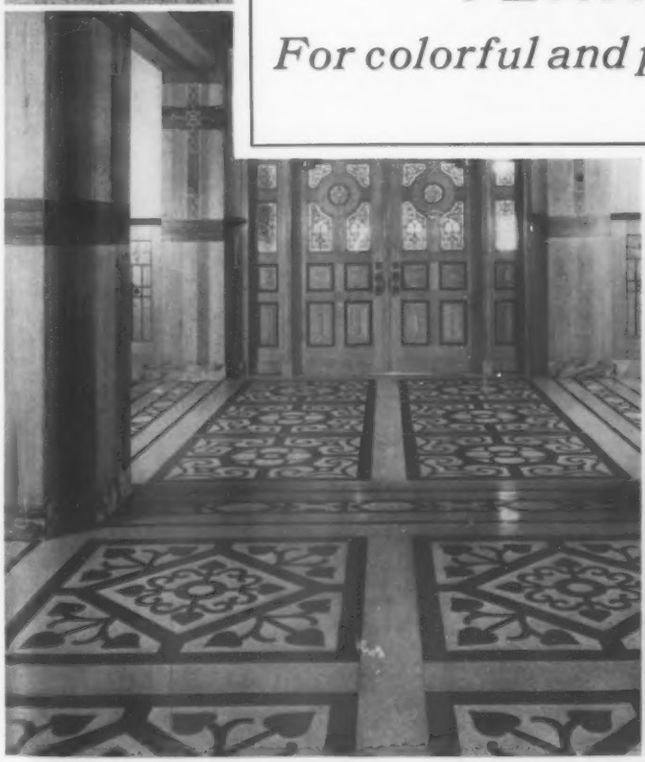
Simplicity marks this efficient Terrazzo floor in the Friendship School, Friendship, N. Y. Note the Terrazzo Wainscoting, that makes cleaning so easy

Distinctive—colorful—durable, is this floor in Samuel Gompers High School, New York City, thanks to Terrazzo. One of many such fine examples



TERRAZZO

For colorful and permanent floors



Harmony is the keynote of this hallway in the Josephinium Pontifical College at Worthington, Ohio, and the Terrazzo floor perfectly carries out the design detail of the walls and door

For durability and efficiency the Lowell School in Sioux Falls, South Dakota selected Terrazzo for this wainscoting and stairway. Note how corners and edges mold together

NATIONAL FIREPROOFING CORPORATION

General Offices: Pittsburgh, Pa.

BRANCHES

New York, 205-17 E. 42nd Street | Chicago, Morton Building | Philadelphia, Architects Building
Detroit: 5737 Commonwealth Avenue & N. Y. C. R. R. | North Birmingham, Ala.

IN CANADA: National Fire Proofing Company of Canada, Ltd., Toronto, Ontario

FOR WALLS OF ENDURING BEAUTY

For walls, partitions, and wainscots in school buildings of all kinds, Natco Glazed Structural Facing Tile is preferred because of its pleasing appearance, sanitary qualities, ease of cleaning, insulation advantages, as well as savings in erection and maintenance costs. Wide variety of unfading colors and mottles available.

NATCO GLAZED STRUCTURAL FACING TILE

Furnished in 8 x 16¼ inch, 5 x 12 inch, and 5 x 8 inch face sizes for 3⅜, 5⅜, and 8-inch wall thickness, also in 1¾ inch for furring. Made by deairing process which eliminates surface imperfections. No future painting, plastering or repair bills. First cost is last cost.

Glass-hard surfaces are easily cleaned and kept clean, are not affected by heat, cold, dampness, grease, or chemicals. Estimates of the cost and quantities of Natco Glazed Structural Facing Tile gladly given. Write for your copy of our new catalog on Natco Glazed Structural Facing Tile.

NATCO BULL DOG STAIR TREADS

Made of hard-burned clay in pleasing cream buff shades, the Natco Bull Dog Stair Tread is permanently slip-proof with long wearing qualities, provides a standard construction, which greatly simplifies the job of stair designing, and effects sizeable economies in construction and maintenance. Write for Bull Dog Stair Tread literature.

A NATCO TILE FOR EVERY PURPOSE

For backing brick walls, for complete exterior and interior walls, for fireproof floors of many kinds, as a protection for steel structural members, for beautiful and enduring roofs, there is a Natco Structural Clay Tile that has an application somewhere in every building, everywhere in some buildings. Tell us what particular type of construction you have in mind and we shall be glad to recommend a particular type of Natco Structural Clay Tile, which will most efficiently serve the purpose.

THE CELOTEX CORPORATION

919 N. Michigan Avenue
Chicago, Illinois

CELOTEX ACOUSTICAL SERVICE

IN every part of the United States there is established an exclusive distributor for Celotex Acoustical Products. These independently owned and operated concerns provide prompt, efficient, and dependable service in analyzing acoustical problems, recommending the proper materials and application, and submitting estimates. The manufacturer is able by this means to assure users and itself of capable, conscientious responsibility for results.

PAINTABLE ACOUSTI-CELOTEX PERMANENT

TRADE MARK REGISTERED U. S. PATENT OFFICE

Acousti-Celotex sound absorbing tile is a highly efficient acoustical material whose most distinguishing characteristic is its perforations. These perforations (patented) are of definite diameter, depth and spacing. The C-series tiles are made of cane fibre; the M-series tiles are made of mineral fibre or aggregate.

INSTALLATION

This product can be applied to both old and new ceilings quietly and without interrupting routine.

MAINTENANCE

The Acousti-Celotex brand tile is available in various painted, washable finishes. It may be cleaned easily to renew its original color, until repainting is necessary. Because of the patented perforations, it may be painted repeatedly without lowering its noise-absorbing efficiency.

FIRE RESISTANCE

The Acousti-Celotex product, M-series, is fire-resistant, permitting its use in fireproof construction. Although less fire-resistant, C-series is more generally used because of its economy and entirely reassuring experience record in hundreds of school buildings.

PERMANENCE

Acousti-Celotex brand materials do not disintegrate, flake, peel, or lose their efficiency under any condition of normal use.

COST

The first cost of Acousti-Celotex acoustical tiles is surprisingly low in comparison with the resulting benefits or with other acoustical materials. The upkeep presents no greater difficulties than conventional school interior finish.

This close-up shows the application of paint to Acousti-Celotex tiles. Note how holes are always kept clear of paint, thus assuring constant and permanent maintenance of original noise-deadening properties

PERFORMANCE

Noise-reduction coefficients of the Celotex Acousti-Celotex tiles range from .50 to .80. They are now in use by prominent schools and universities in all parts of the country, and are highly praised by school boards and teachers for their noise-absorption benefits in corridors, classrooms, auditoriums, gymnasiums, and swimming pools.

ABSORBEX

REG. U. S. PAT. OFF.

The Absorbex brand product is made of cement-coated wood fibres, compressed in matted form with a natural richly textured finished surface. It is uniform in thickness and contains millions of minute air cells affording high insulation, structural strength, fireproofness, and noise-absorbing value.

The wood fibre acoustical tile is available in three textures: fine, medium, and coarse, and the fine-textured product, Type A, is available in a variety of tile sizes.

INSTALLATION

This product can be applied to both old and new ceilings quickly and economically.

MAINTENANCE

The Absorbex acoustical material can be cleaned and painted without materially affecting its initial efficiency. Paints used and their method of application are important factors and the manufacturer should be consulted before painting is undertaken.

PERMANENCE

Absorbex noise-absorbing tiles do not disintegrate, flake, peel, or lose their acoustical efficiency under any normal condition of use. Proper precaution must be taken in painting.

FIRE RESISTANCE

The Celotex product, Absorbex sound absorbing tile, under rigid tests conducted by Columbia University, and other laboratories, has been approved as fire-retardant, permitting its use in fireproof construction.

COST

Original and upkeep costs are moderate.

PERFORMANCE

Noise reduction coefficients of the Absorbex acoustical corrective sound absorbing tiles range from .50 to .90. They have been approved by prominent school authorities and are widely used in this field.

CALICEL

REG. U. S. PAT. OFF.

Calicel acoustical corrective tile and its allied products, Calistone and ornamental Castone, are of interest to schools and universities for use in auditoriums, chapels, and other buildings where ornamental wall treatment must be combined with acoustical correction. In new buildings or modernization work these products provide an interior finish with the charm and beauty of stone, travertine, or marble, plus high noise-absorption ability.

Calicel Standard tile is also widely used in auditorium, corridor and classroom treatment, where its qualities of unique appearance, high noise absorption, and incombustibility appeal.

Calicel and Calistone products have as their base an aggregate of basically expanded stone, highly cellular in structure. The selected aggregate is compressed with suitable inorganic binder in molds to form tile of desired size, thickness and shape.

INSTALLATION

Calicel tiles are applied to finished wall or ceiling surfaces with approved adhesives.

MAINTENANCE

Calicel Standard tile is available with a factory-applied painted finish. Commercial wallpaper cleaners are effective in removing surface dust or dirt.

FIRE RESISTANCE

All Calicel products are incombustible.

COST

Calicel products provide interior finish and decoration comparable with more costly conventional materials and in addition provide effective noise absorption. The manufacturer will be glad to co-operate with school and university officials and architects in submitting suggested decorative treatments of individual problems.

THERMAX

REG. U.S. PAT. OFF.

STRUCTURAL INSULATING SLAB BY

CELOTEX

FOR SOUND-DEADENING, FIRE-RESISTANT PARTITIONS AND ROOF DECKS OR CEILINGS

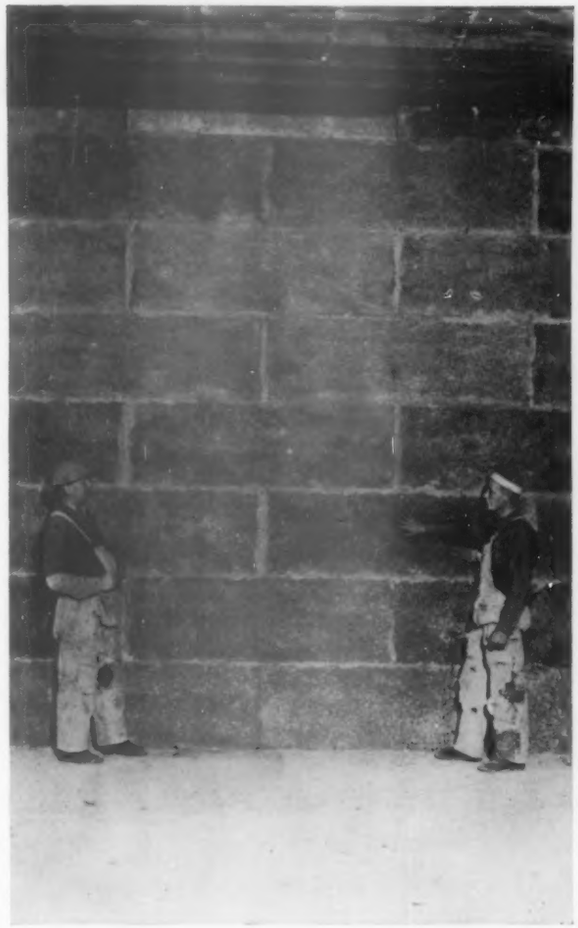
OUTSTANDING CHARACTERISTICS

Thermax structural insulating slabs are made of clean, shredded fibres coated and bound with fire-resistant cement. It is manufactured in thicknesses of 1″, 2″, and 3″. Its fire-resistance has been tested and classified by the Underwriters' Laboratories, Inc. It possesses qualifications of fire-proofing approved by City, State, and Federal Departments. It is structurally strong, and it is sound-deadening. Partitions made of Thermax slabs and plastered are effective for confining noise and reducing its transmission to adjoining rooms. Thermax Structural Insulation is used as sheathing and roof boarding, furring and insulation, partitions, ceilings, and roof decks. It makes an ideal base for plaster or stucco.

AS INTERIOR PLASTER BASE

On walls and ceilings it is an ideal fire-proofing and sound-deadening plaster base—strong plaster bond. It is especially applicable to school construction since its use throughout the structure ably fulfills required safety methods of construction.

Economical maintenance and lower operating costs are the next progressive step in modern schools. Standard 12″ exterior brick walls, furred with 3″ Thermax slabs for insulation and plaster base, show heat transmission of .095 B.t.u. as compared to .250 B.t.u., the figure for uninsulated 12″ brick walls with metal lath and plaster. Thus a great heat saving is possible in wall areas so treated. Thermax structural insulation performs a similar function for top-floor ceilings and roof decks.



THE AMERICAN SCHOOL AND UNIVERSITY

SOUND-DEADENING

There may be a public speaking class on one side, and a debating team going full tilt on the other, but the study room in between need not be disturbed if the separating walls are made of Thermax sound-deadening insulation. Many sound-isolated classrooms in schools throughout the country offer daily evidence of the efficiency of these insulating slabs.

Thermax slabs have effective sound insulation properties. They are recommended for plastered sound-deadening partitions and sound isolation for machinery rooms, gymnasiums, music rooms, cafeterias, etc.

THERMAX

REG. U.S. PAT. OFF.

STRUCTURAL INSULATING SLAB BY

CELOTEX

When Thermax Structural Insulation is left exposed and painted, an attractive and highly sound absorbing treatment (fire-resisting) is economically obtained. It is ideal for ceilings of gymnasiums, auditoriums, music rooms, etc.

INSTALLATION

Thermax slabs are easily and rapidly erected by regular mechanics. It saws like lumber where fitting is required. The light weight of the units makes one-man handling convenient, thus the large boards or slabs, with a surface area of approximately one square yard, combine speed with economy.

COSTS ARE REASONABLE

Considering that Thermax slabs are uniform, because of rigid factory supervision; that they are fungi-proof, termite-proof, clean, and odorless; that they afford no food value to rodents; considering the fire-resisting and structural characteristics of Thermax insulation, the cost is appreciably low.

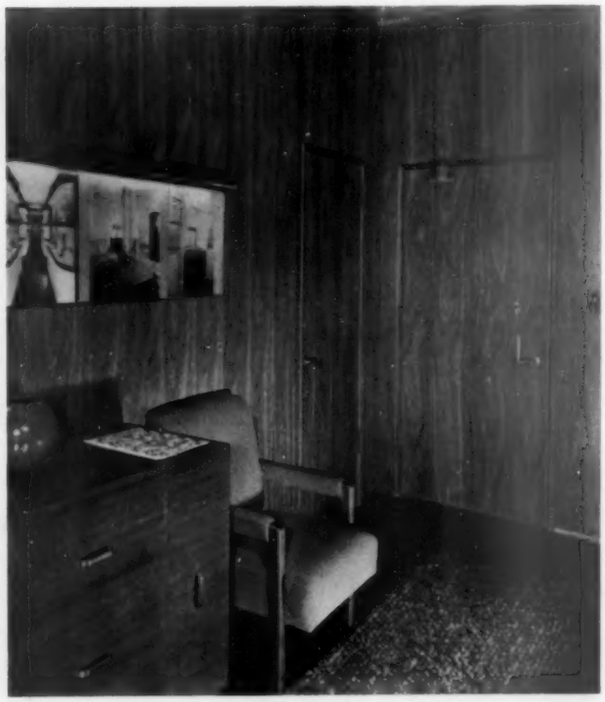
THE AMERICAN SCHOOL AND UNIVERSITY

CELOTEX

REG. U. S. PAT. OFF.

TEXBORD

TRADE MARK



For principal's office, faculty rooms, or other rooms where special beauty and richness are desired, Celotex Texbord planks are highly recommended. They bring all the richness and beauty of finest solid wood paneling at a fraction of the cost.

Celotex Texbord planks are faced with genuine cabinet wood veneers of mahogany, walnut or avodire securely adhered to a base sheet of Celotex cane fibre board. Each unit is an individual plank with a grain and figure different from every other. Planks have beveled shiplapped joints, thus the complete installation has the appearance of solid wood paneling beautifully grooved in plank formation. No nail heads show.

Celotex Texbord planks can be applied to continuous surfaces without removing baseboards, mouldings, or window casings. Planks are flexible enough to permit bending around archways and moderate curves. Solid wood mouldings to match are available.

CELOTEX
REG. U. S. PAT. OFF.
ROOF INSULATION

Celotex brand Roof Insulation keeps the heat of the summer sun outside and materially reduces winter heat losses through the roof. Thus students in top floor classrooms are more comfortable in all weather, and the fuel saving alone should return the original cost of the installation in a few years—with dividends.

Celotex Roof Insulation Cane Board is a strong

Applying Celotex Roof Insulation on RCA Bldg., New York City

rigid board made of firmly interlaced and felted cane fibres. It is designed for the insulation of all types of roof decks: wood, concrete, precast tile, poured gypsum, metal, slate, etc. It provides a highly desirable surface for roofing materials. Its thermal conductivity meets the requirements of United States Federal Specifications.

EXCLUSIVE FEROX PROCESS
(Patented)

All Celotex cane fibre products are manufactured under the Ferox Process (patented) and therefore effectively resist damage by fungus growth, dry rot, and termites (white ants).

CELOTEX
REG. U. S. PAT. OFF.
BUILT-UP ROOFING

Celotex Built-Up Roofing makes use of the latest scientific development in asphalt roofing products Only the highest quality materials from felts to asphalt are used—only approved competent workmen install Celotex built-up roofing. Bonded when requested.

School authorities considering built-up roofing for new buildings, or to replace old roofs, are urged to give special consideration to Celotex TRIPLE-SEALED 19/UP roll roofing — an outstanding achievement in built-up roofing manufacture. This is a superior grade mineral-surfaced roofing, obtainable in a variety of colors including aluminum finish. Its other advantages include two-ply construction, blind nailing and head-lap protection.

CELOTEX
REG. U. S. PAT. OFF.
TRAFFIC TOP
TRADE MARK

This new product offers the modern way to turn unused flat roof areas into usable recreation space. Made of Celotex cane fibre board impregnated with asphalt, it is attractive in appearance and resists the ravages of weather. Its resiliency makes it the ideal "playground" surfacing material. Easily applied to new or old roofs, it adds less weight than ordinary slag or gravel surfacing. Passes firebrand tests. Proofed against termites and dry rot by the exclusive, patented Ferox Process. Available in colors.

JOHNS-MANVILLE

22 East 40th Street, New York, N. Y.

OFFICES IN ALL LARGE CITIES

J-M SOUND CONTROL

Students in many of our schools and universities today are 40% deaf—due to the bedlam of noise surrounding them and the poor acoustics of most classrooms and auditoriums. This is one of the most serious problems today confronting educational authorities.

Yet, there is one sure way to solve the problem once and for all. Johns-Manville, pioneer in the field of sound control, offers time tried and proved materials and methods to banish this efficiency-lowering, nerve-wracking evil quickly and economically. Even the noisiest room can be quieted and made a pleasant, efficient place in which to teach and study. J-M Sound-Absorbing materials reduce unwanted sound to harmlessness and, at the same time bring desirable sound —in the form of lectures and public addresses—directly to the ears of students without distortion or interference.

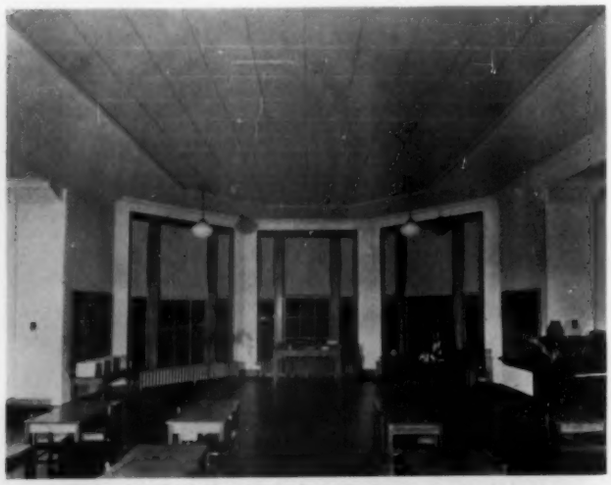
Ideal for Schools and Universities

The most widely used material for the quieting of schools and universities is Johns-Manville Sanacoustic. Consisting of a perforated metal facing backed up with a rock wool sound-absorbing pad, this material is so designed that it absorbs 85% of all sound that strikes it.

Both the metal facing and the rock wool pads are completely fireproof, a vitally important factor. Because it is 100% mineral in composition, Sanacoustic is vermin and rot-proof. The triple-enameled, triple-baked surface is non-porous, dirt-repelling —may be easily cleaned with a damp cloth and may be painted repeatedly without impairing its sound-absorbing efficiency.

Sanacoustic Can Be Easily Washed; Frequently Repainted

J-M Sanacoustic is quickly, easily installed with a minimum of dirt and inconvenience. Furthermore, the entire installation may be salvaged and relocated in case of alterations.



J-M Sanacoustic Applied in the Kindergarten of the Christian Park School, Indianapolis, Indiana

J-M Offers a Complete Service

Sanacoustic, however, is only one of a large variety of Johns-Manville materials for noise quieting and the correction of faulty hearing conditions. Because school quieting and acoustical correction problems vary widely, some other product in J-M's complete line may solve a particular problem more effectively.

Permacoustic, for example, is highly recommended for use in auditoriums, offices and wherever a particularly decorative treatment is desired. Transite Acoustical units are recommended for use in gymnasiums, swimming pools, shops and other locations where excessive moisture or severe physical abuse may be encountered. For preventing noises generated in wood shops, machine shops, ventilating equipment and similar noisy areas from reaching classrooms and study halls, Johns-Manville has developed an ingenious system of sound isolation that confines these sounds and vibrations to their source.

Ask for Full Details

You will be interested in the Johns-Manville brochure, "Methods of Sound Control for Schools and Universities," AC-16A. It describes the characteristics and uses of all J-M Sound Control Materials, and tells how you may obtain the services of Johns-Manville Acoustical Engineers without obligation on your part. The booklet is free on request at any Johns-Manville office.

J-M ASPHALT TILE FLOORING

Johns-Manville Type A Asphalt Tile Flooring, composed of rectangular units of various sizes and colors, provides a resilient, quiet, decorative and long wearing floor that is ideal for use in the modern school or university. With the great variety of plain and marbleized colors and innumerable patterns possible, any desired effect is easily obtained—bright and cheerful, dark and rich, gay or unobtrusive—harmonizing perfectly with the decorative scheme of any school or university location.

Quiet and Sanitary

The unusual resiliency of J-M Asphalt Tile Flooring cushions footsteps and promotes quiet foot traffic. Furthermore, it is odorless, non-absorbent and will not originate dust. This, with its ease of cleaning, makes it particularly adapted to the high sanitary standards that must be maintained in all school and university locations.

Fire-resistant, Easily Maintained

J-M Asphalt Tile Flooring is fire-retardant and has been officially approved for use in fireproof buildings in many large cities throughout the country. Furthermore, the toughness and durability of the material is such that, baring exceptional abuse, it requires no attention or expense for maintenance beyond ordinary cleaning. For very severe service, such as that encountered in school corridors, halls, lobbies, etc., the special J-M Heavy Duty Asphalt Tile Flooring is recommended.

Details on Request

J-M Asphalt Tile Flooring costs no more than other resilient floorings, and in many cases the price is considerably less. For complete details on both Type A and Heavy Duty Asphalt Tile, send for Brochure FL-20. Address Johns-Manville, 22 East 40th Street, New York, N. Y.

J-M Asphalt Tile Flooring is ideal for use in all school and university locations

J-M Built-up Roofs are permanent, weatherproof, fire-resistant

J-M BONDED BUILT-UP ROOFS

Fireproof — weatherproof — rot - proof — durable — those are the outstanding features of J-M Bonded Built-up Roofs. Built up of alternating layers of asphalt-saturated asbestos felt and roofing asphalt, they combine two of the most durable materials known to science — provide permanent protection and virtual freedom from maintenance on all types of school and university buildings.

Will Not Dry Out

Asbestos fibres differ from organic fibres in that they are solid, non-capillary. In J-M Roofing felts they form a solid stone blanket that prevents the evaporation of the lighter oils in asphalt and preserves their waterproofing qualities indefinitely, despite the drying out action of the sun. Hundreds of J-M Built-up Asbestos Roofs, after more than twenty years of virtually maintenance-free protection against fire, sun and weather, are still in excellent condition.

J-M Roofinsul

J-M Roofinsul is a strong, rigid, light weight insulating material for use under J-M Built-up Roofs. It retards the passage of heat through the roof, making top floors more comfortable in summer and saving fuel in winter.

Complete Details on Request

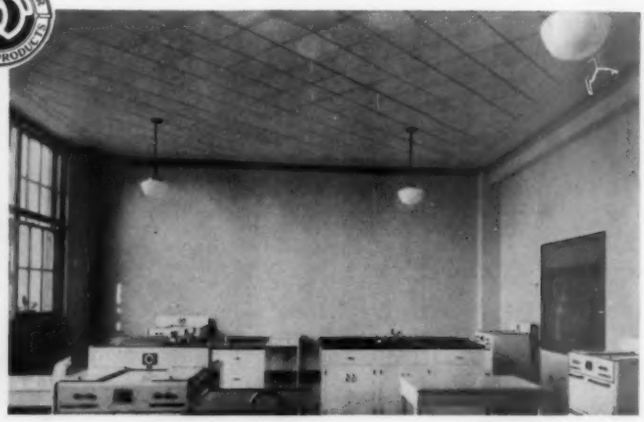
Johns-Manville offers over thirty types of built-up roofs, both smooth and slag or gravel surface at a complete range of prices. For complete information on the entire subject of built-up roofs ask for the new brochure, "J-M Bonded Built-up Roofs." Address Johns-Manville, 22 East 40th Street, New York, N. Y.

WOOD CONVERSION COMPANY

Manufacturers of

NU-WOOD Interior Finish . . . and BALSAM-WOOL Sealed Insulation

St. Paul, Minnesota



NU-WOOD INTERIOR FINISH—Nu-Wood Interior Finish used either for remodeling or in new construction performs THREE important functions at one low cost—decoration, insulation, noise correction. With its warm, rich beauty, its textured surface and variety of design possibilities with tile, plank, board and wainscot, it provides appropriate decoration for school classrooms, offices, corridors, auditoriums, cafeterias, etc. Nu-Wood **absorbs noise,** corrects faulty acoustics, provides quiet needed by students for concentration. Its efficient insulation value offers substantial aid in maintaining year-round comfort in the school.

Sound Absorption—½" Nu-Wood 3090 at 512 cycles.
Thermal Conductivity—324.
Light Reflection—Ivory Nu-Wood 65%, Tan 40%, Variegated 38%.

Nu-Wood is made of clean, new wood fibres compressed into a strong, rigid structural material. Its many harmonizing colors are pleasingly appropriate for school use. Each unit is provided with edges, which experience has shown to be best suited for carefully designed interior finish application.

KOLOR-TRIM MOLDINGS—Now, with the new Kolor-Trim predecorated wood moldings, the economy of Nu-Wood interiors is even greater, as painting on the job is unnecessary. Available in a variety of semi-glossy enamel colors and in three patterns, these moldings make possible a complete interior finish job at a single low cost. The range of colors available in Kolor-Trim Moldings offers an appropriate selection for every design, with assurance that the finished work will be in complete color harmony.

NU-WOOD INSULATING SHEATHING AND LATH—These companion products offer insulation and greater structural strength. Nu-Wood Sheathing has a double coating on both sides of a special moisture-proofing compound—assures stronger, windproof insulated construction.

Nu-Wood Lath has several times the bonding strength of wood lath. Continuous surface eliminates dirty lath marks and reduces cracks. V-joint resists trowel pressure in both directions, assures unbroken insulation value.

THE BARRETT COMPANY

Manufacturers of Roofing and Waterproofing Materials

40 Rector Street, New York, N. Y.

2800 So. Sacramento Avenue
Chicago, Illinois

Birmingham
Alabama

PRODUCTS

Roofing Materials—For Flat Surfaces: Barrett Specification Pitch and Felt Roofs, Black Diamond Pitch and Felt Roofs. Tarred and Asphalt Saturated Felts and Fabrics, Coal Tar Pitches, Asphalt Cements, etc.

For Steep Surfaces: Barrett Steep Roof Pitch and Felt Roofs, Anchor Asphalt and S.I.S. Roofing. Barrett Asphalt Shingles and Roll Roofings. Roof Cements and Coatings.

Miscellaneous—Waterproofing for foundations, swimming pools, tunnels, floors, etc., special specifications submitted. Rock Wool Insulation, Insulating and Building Papers, for sheathing, lining, etc. Dampproofing and Protective paints, Wood Preservatives. Tarvia-lithic for playground surfacing, roadways, paths and tennis courts. Roof Drain and Vent Connections.

For complete information about these and other products, write The Barrett Company, 40 Rector Street, New York City.

THE GREATEST NAME IN ROOFING

It is significant that, in a nation which is particularly careful of its youth, so many of America's finest school buildings should be protected with Barrett Specification Roofs. Experienced architects, school board members and university executives know that there is maximum safety as well as maximum service in a Barrett Specification Roof. No other roof, it seems, so completely satisfies the exacting requirements of school and university builders.

Barrett Specification Roofs carry the National Board of Fire Underwriters Class A rating—the highest assurance of fire safety. Their gravel or slag surface is immune to fire hazard caused by flying sparks and embers.

These famous roofs are constructed of alternate layers of tar-saturated felt and coal-tar pitch, the world's greatest waterproofing agent. They are applied by Barrett Approved Roofers, who are selected on the basis of their experience, ability and integrity. Bonded for 20 years against repair and maintenance expense, they regularly outlast their bonded periods by several decades.

On any roofing or waterproofing problem, consult with us or your local Barrett Approved Roofer. Look in the Classified Telephone Directory under "Roofers."

FREE ROOF INSPECTION

For many years, The Barrett Company has offered building owners an unique service that has been the means of saving many thousands of dollars in upkeep expenses. On request, a Barrett Roof Inspector will make a careful survey of your roofs, flashings, copings, parapets, etc., and render a complete unbiased report. This service is free on buildings with roof areas of 5,000 square feet and up, located east of the Rockies.

Barrett Specification Roofs

The modern Ansonia High School, at Ansonia, Conn., is protected by a Barrett Specification Roof. Arch.: William Lescaze. Associate: Vernon F. Sears, New York. Gen'l Cont.: William L. Crow Construction Co., New York. Rfg. Cont.: G. R. Cummings Roofing Co., Meriden, Conn.

THE PHILIP CAREY COMPANY

Manufacturers of

Roofing and Waterproofing Products, Heat Insulations

Lockland, Cincinnati, Ohio

The roof of a school building represents little more than 1% of the total construction cost yet on its durability and weather-resisting qualities depend the protection of the other 99%. The school roof should be designed and built to last the life of the building. Re-roofing is an expense that need not be incurred under ordinary conditions if the right roof is selected and properly constructed.

SPECIFY

Carey ROOFS

FOR LASTING PROTECTION

Carey Roofs meet every requirement for modern school construction. For more than sixty years Carey Roofs have been specified for important public buildings throughout the United States, and their application to new school construction is increasing year by year because they have proved their durability and lasting protection against weather.

The quality of materials entering into Carey Built-Up Specifications are carefully checked by our engineering department and research laboratory, allowing a liberal factor of safety as to tensile strength, number of plies and thickness of plies, to assure adequate and permanent weatherproof protection.

FREE ROOF SURVEY

The Carey Roof Survey Plan has been in operation for several years and has been the means of cutting roofing upkeep expense to a minimum. Without obligation on your part, a Carey Inspector will make a careful survey of your roofs, flashings, parapets, etc., and give an honest and impartial report on their condition.

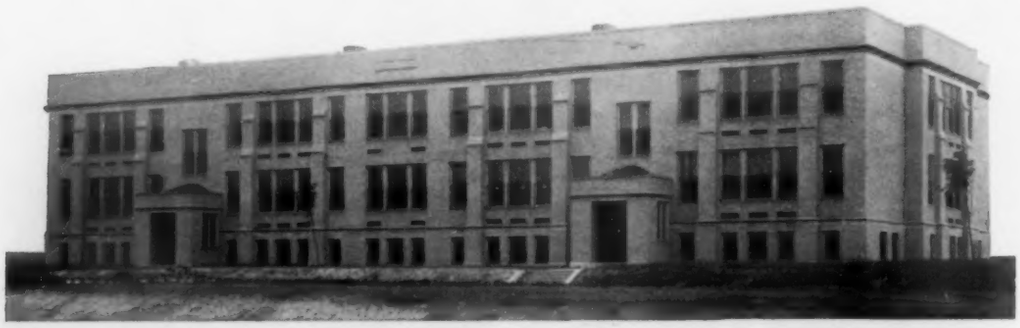
Carey Asfaltslate Shingles represent the standard of quality in composition shingles. They are built especially rugged and substantial to give extra years of trouble free service. They are proof against all ordinary fire risks and need no paint or other upkeep expense. Be sure to see the Carey Cork Insulated Shingle which is constructed to provide roof insulation that is automatically applied at the same time the roof is put on.

Careystone Asbestos Cement Shingles. Made of asbestos and cement, it provides a permanent roof possessing natural properties that enable it to resist the destructive influences of time, weather and fire.

Carey Heat Insulations. For low pressure steam or hot water heating systems, Careycel Pipe Covering has no equal. It combines high insulating efficiency with low cost. The Carey Heat Insulation Line is complete. A special insulation material to meet every service condition. Temperature ranges from zero to 2500° F.

Carey Waterproofing Materials. Carey waterproofing product for basement walls and swimming pools; Protective coatings to repair leaks and prolong the life of all types of roofs, protection paints for hot and cold metal surfaces.

For complete information on Carey Roofs and other products, write The Philip Carey Company, Lockland, Ohio.



The RUBEROID Co.

EXECUTIVE OFFICES
500 Fifth Avenue, New York, N. Y.
DIVISIONAL OFFICES
NEW YORK CHICAGO BOSTON (MILLIS) ERIE BALTIMORE MOBILE

Eternit Gothics

RU-BER-OID

ROOFING AND BUILDING PRODUCTS

ASBESTOS-CEMENT SHINGLES

For pitched roofs, where beauty is a factor, where a roof must be waterproof, fireproof, rotproof and time-defying—Eternit-Asbestos-Cement Shingles win favor with the architect. These shingles, Ruberoid-made, come in various finishes, designs and colors. One of the most popular is the Eternit Gothic, textured like natural rock.

Eternit Timbertex

Tapered with a heavy butt, the Gothic Shingle lies perfectly, giving the effect of massiveness and yet without the burden of extra weight. Eternit Gothics are furnished in random widths and may be applied with staggered butts. The shingle is 12″ wide and 16″ long with approximately 5/16″ butts. Applied with 7″ x 12″ exposure. Weight approximately 525 lbs. per square.

The companion Asbestos-Cement Shingle is Eternit Timbertex. This product reproduces the lovely texture of weather-aged cypress. It has all the qualities of the Gothic, but gives the effect of mellowed wood. Its size is 8″ x 16″, with approximately 1/4″ thick butts. The exposure is 8″ x 7″ and the weight is 525 lbs. per square.

Where a less expensive, yet durable, fire-resisting roof is required, Ruberoid can supply Asphalt Shingles in various weights, colors and designs. Full descriptive literature upon request.

BUILT-UP ROOFS

RU-BER-OID Built-up Roofs, for flat surfaces or roofs with a slight pitch, have been widely used on school buildings. There are four popular types of Built-up Roofing: Asbestos felt and asphalt, coal tar pitch and tarred felt, asphalt felt and asphalt, and the combination roof consisting of asphalt felt, asphalt-saturated asbestos felt and roofing asphalt. Ruberoid makes all of these types so that you can choose according to climatic conditions, proximity to fire hazard, construction of the roof deck, the proper type to meet any condition.

When desired, RU-BER-OID Built-up Roofs are bonded for 10, 15 or 20 years, depending upon the specifications. Bonded roofs are applied only by Approved Ruberoid Roofing Contractors. Complete Catalog will be mailed upon request.

INSULATING MATERIALS

From the viewpoint of efficiency, Rock Wool is one of the finest insulating materials. Ruberoid offers you Rock Wool in three forms—loose or bulk for packing, granulated for pouring and in pre-formed bats for use between joists, rafters and studding. Complete data will be gladly forwarded upon request.

ASBESTOS PIPE COVERINGS

The Ruberoid Co. has a complete line of heat and cold insulating products, including Asbestos and 85% Magnesia Pipe Coverings, Asbestos Papers, Sheet and Block Insulations, Insulating Cements, etc. A Catalog covering RU-BER-OID Insulating Materials will be gladly furnished on request.

NEWTILE WALL PANELS

FREE CATALOG

Newtile, an asbestos-cement wall panel simulating perfectly ceramic tile, is particularly popular for school use. These wall panels have a lustrous finish, are easily kept clean and are ideal for kitchens, cafeterias, laboratories, shower rooms, etc.

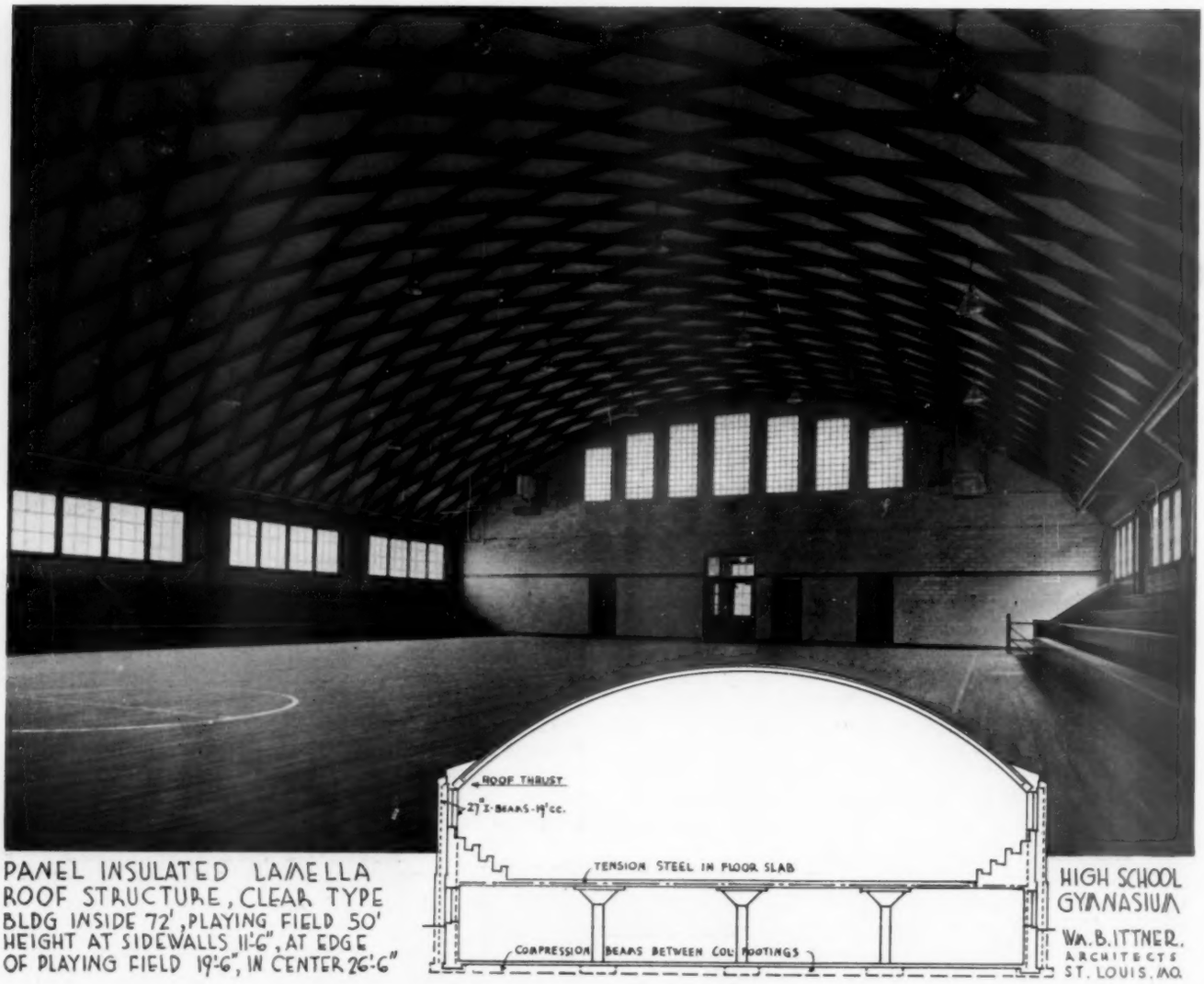
RU-BER-OID Newtile

FREE CATALOG

For complete information write to School Engineering Department THE RUBEROID CO., 500 Fifth Avenue, New York, N. Y.

LAMELLA ROOF SYNDICATE, INC.

45 West 45th Street, New York, N. Y.



PANEL INSULATED LAMELLA ROOF STRUCTURE, CLEAR TYPE BLDG INSIDE 72', PLAYING FIELD 50' HEIGHT AT SIDEWALLS 11'-6", AT EDGE OF PLAYING FIELD 19'-6", IN CENTER 26'-6"

HIGH SCHOOL GYMNASIUM
WM. B. ITTNER, ARCHITECTS
ST. LOUIS, MO.

Lamella Trussless Roofs are arch structures of wood or steel consisting of a series of short sections arranged in a diamond pattern to form a continuous arch. Their design follows accepted engineering practice in conformance with local climatic conditions and specific requirements of the local building codes.

Fire resisting qualities are rated in all localities at least equal to unprotected steel with open rafters.

Licensees will assist the architect in the detailed design of the roof, its connections and supports.

LAMELLA
Reg. U. S. Pat. Off.

Lamella Trussless Roofs permit greater clearance over the playing field at lower side wall heights than possible with trussed ceilings, without increase in the cubic contents, and at a decided economy in the cost of the building.

Acoustical qualities are unexcelled. Panel insulation provides sound absorption as well as increased insulating efficiency thru the thin air blanket behind it.

AUTHORIZED LAMELLA LICENSEES

NEW YORK, N. Y., 45 W. 45th Street
Lamella Constructions, Inc.
ROCHESTER, MINN., 112 N. E. 7th Street
The Kruse Company
ST. LOUIS-GLENDALE, MO., 785 Bismarck Ave.
Lamella Roof Co.
SAGINAW, MICH., 726 North Niagara Street
L. W. Wells Construction Co.
OMAHA, NEB., 1324 Pierce Street
Lamella Roof Co.
TOPEKA, KAN., 1510 W. 17th Street
Ira D. S. Kelly
DALLAS, TEX., 630 Wilson Building
J. L. O'Hearn
SAN ANGELO, TEX.
West Texas Lumber Co.
HOUSTON, TEX., 1615 Waugh Drive
Allen Construction Co.
McALLEN, TEX., 518 No. Main Street
E. A. Noser
TWIN FALLS, IDAHO, P. O. Box 1153
Lamella Roof Co.
PHOENIX, ARIZ., 806 W. Madison Street
Summerbell Roof Structures of Arizona
SALT LAKE CITY, UTAH, 333 W. First South St.
Utah Lumber Company
LOS ANGELES, CALIF., 754 E. 29th Street
Summerbell Roof Structures
OAKLAND, CALIF., 354 Hobart Street
Summerbell Roof Structures of N. Calif.
PORTLAND, ORE., 417 Davis Building
Summerbell Roof Structures of Oregon
SEATTLE, WASH., 2411 Eighth Ave. W.
Summerbell Roof Structures of Washington
MONTREAL, QUE., 1226 University Street
Lamella Trussless Roof Co., Ltd.

THE TEXAS COMPANY

Manufacturers of

TEXACO ROOFINGS and SHINGLES

TEXACO ROOFING DEALERS EVERYWHERE East of the Rockies

Branch Offices of The Texas Company

Atlanta, Ga.
Buffalo, N. Y.
Chicago, Ill.
Dallas, Texas
Denver, Colo.
Houston, Texas
Minneapolis, Minn.
New Orleans, La.
New York, N. Y.
Norfolk, Va.
Indianapolis, Ind.
(Indian Refining Company)

TEXACO REG. T. M.

... ONE OF THE BEST KNOWN NAMES IN ROOFING FOR MORE THAN 28 YEARS

Natural prerequisites of roofings for school buildings are the substance and quality of the roofing products specified, the reputation and integrity of the manufacturing organization—and the ability to render unusual service in this specialized school field.

The experience of The Texas Company in the manufacture of roofings has proved repeatedly the ability of Texaco Asphalt Roofing Products to meet the most rigid requirements and specifications established for school buildings, whether in new construction or in re-roofing . . . long-lived endurance, protection, attractive appearance and lasting economy.

One simple fact is significant in understanding the high standards of quality and economy gained by using Texaco Roofings. **The Texas Company is one of the world's largest producers of asphalt . . . which is recognized as the most efficient water-proofing agent known.**

This, plus the unlimited resources and facilities of an extensive manufacturing and distributing organization, constitutes a sound reason for specifying Texaco Roofings on school buildings.

FOR COMPLETE DETAILS AND SAMPLES, COLORS AND SPECIFICATIONS SEE THE NEAREST TEXACO ROOFING DEALER OR WRITE TO THE NEAREST DISTRICT OFFICE OF THE TEXAS COMPANY.

LARGE NETWORK OF NEARBY TEXACO WAREHOUSES ASSURES "ON-SCHEDULE" OPERATIONS AND IMMEDIATE DELIVERY THROUGH TEXACO ROOFING DEALERS

School authorities knowing the widespread distribution facilities of The Texas Company have learned that they may obtain local cooperation and immediate delivery through the many Texaco Roofing Dealers and the numerous well-stocked Texaco warehouses located "nearby" for still further convenience and economy.

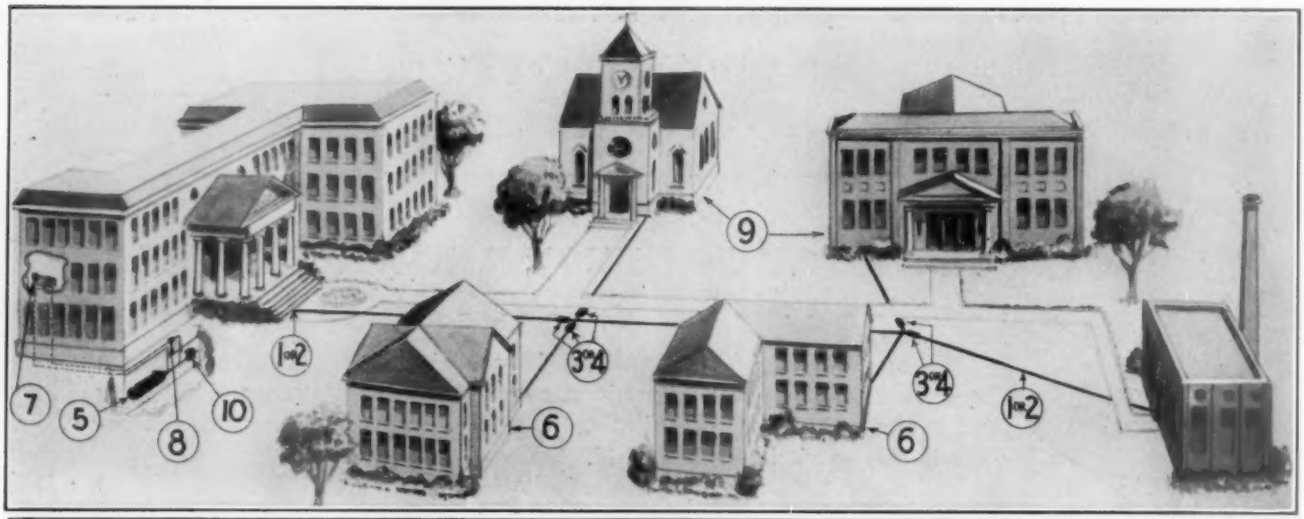
AMERICAN DISTRICT STEAM COMPANY

IN BUSINESS OVER SIXTY YEARS

Manufacturers of District Steam Heating Equipment and ADSCO Water Heaters

North Tonawanda, N. Y.

BRANCHES AND AGENTS IN PRINCIPAL CITIES



(1) RED DIAMOND WOOD CASING	(3) ADSCO SLIP TYPE EXPANSION JOINT	(5) STORAGE TYPE WATER HEATER	(7) RADIATOR VALVES	(9) REDUCING VALVES
(2) ADSCO-BANNON TILE CONDUIT	(4) ADSCO PACKLESS EXPANSION JOINT	(6) INSTANTANEOUS WATER HEATER	(8) VERTICAL STEAM TRAP	(10) ROTARY CONDENSATION METER

ADSCO PRODUCTS Assure Dependable Heating Efficiency for Campus Steam Distribution Line Extensions or Replacements

Specified by Architects and Engineers

When planning new college buildings to be heated by an underground steam line extension from a central heating plant, many college architects and engineers take their specifications for the mechanical equipment from the ADSCO Catalog No. 35. It gives **complete** information from a **single book** on ADSCO Slip and Packless Types of Expansion Joints, ADSCO-Bannon Tile Conduit or Wood Casing for underground steam lines, Condensation Meters, Water Heaters, Pipe Supports, Steam Traps, etc. Send for your copy today.

Approved by Superintendents of Buildings

Superintendents of college buildings, responsible for the efficient operation of mechanical equipment costing thousands of dollars, approve ADSCO Products for steam distribution based on many years of favorable operating experience with ADSCO equipment. To them, an ADSCO specification means assured operating efficiency with a minimum of maintenance.

When new or replacement equipment is required they consult the ADSCO Catalog No. 35 **first** when requisitioning or purchasing steam distribution equipment.

Purchased by College Business Managers

College business managers and purchasing agents buy ADSCO Products with confidence for their campus steam distribution lines.

When new expansion joints, tile conduit, wood casing, condensation meters, water heaters, steam traps, radiator valves or other equipment is required, the **first** buying source is ADSCO to secure dependable products, reasonably priced with prompt delivery assured.

The ADSCO Catalog No. 35 illustrating and describing our equipment should be on every business manager's desk. If you do not have one, please request your copy promptly.

PARTIAL LIST OF USERS OF ADSCO PRODUCTS IN THE SCHOOL AND UNIVERSITY FIELD

Alfred University
American University
Arkansas State College
Barnard College
Bucknell University
Carleton College
Columbia University
Cornell University
Harvard University
Howard University
Iowa State Teachers College
Juniata College
Michigan State College
Middlebury College
Monmouth College
Pa. State Teachers College
Pennsylvania State College
St. Bonaventure College
State College of Wash.
State Univ. of Iowa
Syracuse University
Temple University
Tufts College
Union College
University of Arizona
University of Dayton
University of Florida
University of Maryland
University of Minnesota
University of Montana
University of North Carolina
University of Pittsburgh
University of Rochester
University of Tennessee
University of Texas
University of Toronto
University of W. Virginia
University of Wisconsin
University of Wyoming
University of Utah
Vassar College
Wellesley College
Williams College

REPUBLIC STEEL CORPORATION

General Offices: Cleveland, Ohio

BERGER MANUFACTURING DIVISION
STEEL AND TUBES, INC.—TRUSCON STEEL COMPANY

REG. U.S. PAT. OFF.
TONCAN
COPPER
MO·LYB·DEN·UM
IRON

Through its various divisions and subsidiaries, Republic Steel Corporation offers the most complete line of steels and steel building products manufactured by a single producer. Each of these products is of recognized high quality. Each plays a definite part in helping to make possible better buildings that last for many years and require little or no repair or replacement expense.

Outstanding among these products are Toncan Copper Molybdenum Iron Pipe and Sheets, and Enduro Stainless Steel (discussed on a separate page).

Toncan Iron is a scientifically refined open hearth iron with which copper and molybdenum are alloyed in the correct proportion. It is a metal originated and manufactured to possess one fundamental utility in particular—that of resistance to rust. Because of this, Toncan Iron resists rust to a higher degree than any other ferrous material in its price class.

Toncan Iron is slightly higher in first cost, but over a period of years, it costs less per year of service life. Records of more than 31 years prove its economy.

The sheathing for the parapets on the roof of this high school will resist the attack of the elements for many years to come—it's rust-resisting Toncan Iron

Six Republic products helped to make this half-million-dollar school a better building. Steam return and cold water piping is Toncan Iron. Other piping is Republic steel pipe. Ducts are made of Republic steel sheets. Joists are Truscon. Electrical conduit is Electrunite Steeltubes. Sinks and kitchen equipment are made of Enduro Stainless Steel

TONCAN IRON SHEETS—are available black or galvanized in all standard sizes and gauges. They are ideal for all forms of interior and exterior sheet metal work—roofing, flashing, gutters, eavestroughs, downspouts, ducts, hoods, stacks, tanks, etc. Formed roofing products are available in various styles. Send for a copy of "The Path to Sheet Metal Permanence."

TONCAN IRON PIPE—is available black or galvanized and in standard or extra heavy weight. It is recommended for air, gas, hot and cold water, steam mains and returns, drainage and vent piping where service conditions are such as to cause premature failure in less resistant materials. Write for a copy of "Toncan Iron Pipe for Permanence"—it presents many interesting facts about pipe life and cost.

OTHER REPUBLIC PRODUCTS—For ordinary service, Republic provides steel and copper-bearing steel sheets and pipe. Other Republic steel products include metal office furniture, lockers, shelving, filing cabinets, radiator covers, laboratory equipment, steel windows and doors, flooring systems, metal lath, window ventilators, boiler tubes and electrical conduit. Complete detailed information on any Republic product will be sent upon request.

STANLEY & PATTERSON

INCORPORATED — ESTABLISHED 1884

Manufacturers

AUTOMATIC

Water-Turbine-Driven Emergency Current Supply Generators

150 Varick St., New York

One of our automatic water-turbine-driven Emergency Current Supply Generators, simply connected to the water main in the basement of a school building, will, when Central Station electric current fails from any cause, automatically and instantaneously (actually in 1 1/10 **seconds!**) furnish an absolutely dependable emergency supply of 120 volt 60 cycle A.C. electric current.

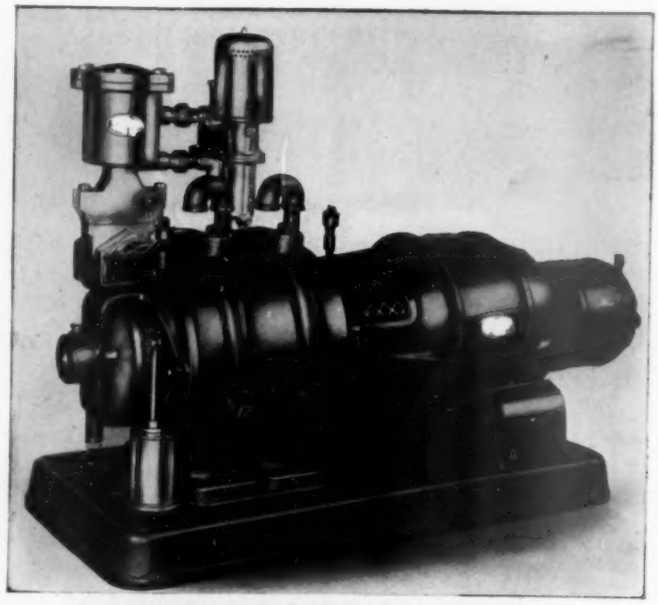
Our water-turbine-driven generators completely do away with the serious menace from sudden darkness in school auditoriums, where possible panic with its accompanying maiming, and even loss of life, places a heavy responsibility upon school trustees and executives.

Storage batteries of the average required capacity entail a continual and considerable expense for charging-current, and when held **in reserve** are frequently out of order when the emergency calling for their use suddenly develops.

Internal-combustion engines unless constantly supervised, frequently fail to start promptly when Central Station current is interrupted. When such units necessitate the storage and pumping of inflammable and explosive fuels universally recognized as a serious fire hazard, Insurance Underwriters are invariably opposed to their use, even though expensive fireproofing safeguards are provided.

Our water-turbine-driven generators furnish the IDEAL supply of absolutely dependable, automatic emergency 120 volt 60 cycle A.C. electric light and power; THEIR FIRST COST IS THE ONLY EXPENSE TO BE MET. They will last as long as a modern school building, with no further outlay for maintenance or repairs.

Once Installed — That's All!



Automatic Water-Turbine-Driven Emergency Current Supply Generator

With the installation of the right size automatic water-turbine-operated generator, a school can always depend upon the uninterrupted operation of the following important equipment:

EMERGENCY LIGHTS IN AUDITORIUMS AND HALLS
CLOCK SYSTEMS
TOWER CLOCKS
SCHOOL PROGRAM CLOCKS AND SYSTEMS
FIRE ALARM SYSTEMS
TELEPHONE SYSTEMS
SCHOOL SIGNALING SYSTEMS
OIL-BURNER OPERATION
MOTION PICTURE APPARATUS
SOUND PROJECTORS
PUBLIC ADDRESS SYSTEMS
RADIO EQUIPMENT
PHONOGRAPH RECORD TRANSCRIPTION
LABORATORY EQUIPMENT OPERATION
THERMOSTATIC TEMPERATURE CONTROL

Full information promptly furnished upon request.

REVERE COPPER AND BRASS INCORPORATED

EXECUTIVE OFFICES AND GENERAL SALES DEPARTMENT
230 Park Avenue, New York, N. Y.

REVERE BUILDING PRODUCTS

FOUNDED BY PAUL REVERE
1 8 0 1

Cheney and Revere Thru-Wall Copper Flashing for protecting buildings against seepage, leaks and efflorescence

Revere Sheet Copper and Leadtex (lead-coated copper) for roofing, gutters, conductor pipes, flashings, skylights, spandrels, decorative applications and termite proofing, also for range boilers

Copper Water Tube, Brass Pipe, Red-Brass Pipe and Copper Pipe for hot and cold water lines, and for lawn irrigation

Herculoy (copper-silicon alloys) for range boilers

CHENEY THRU-WALL COPPER FLASHING

Cheney pioneered and introduced mechanically keyed Thru-Wall Copper Flashing to the architects and engineers of America. Millions of feet have been installed in most of the federal government's fine buildings as well as in colleges, libraries, hospitals, public buildings and office buildings.

Prevents seepage and leaks

Wherever any part of a masonry wall is directly exposed to rain and snow, water seeps into the wall. Penetrating downward, it causes serious damage to both interior and exterior of a building, even to the astral disintegration of the walls. Alternate freezing and thawing of wet walls in cold weather disrupts the masonry, entails expensive repairs, and may even cause a parapet to fall to the ground. **Cheney Thru-Wall Flashing** positively prevents leaks and seepage, and may safely be specified by the architect for the most exacting requirements. It is especially recommended for exposed work.

Prevents defacement of interior plaster

Damp interior walls and ceilings with paint and plaster constantly falling, are a menace to health as well as an eyesore. Temporary repairs to masonry, plaster and paint are costly and fail to remedy the cause. Prevent trouble before it starts, by installing **Cheney Thru-Wall Flashing** when the building is erected.

Prevents efflorescence

Efflorescence appears upon the exterior or masonry wall as a whitish deposit. It is caused by water seeping down through the wall and carrying with it the mineral salts in the mortar and brick to the wall surface, where the water evaporates and leaves the unsightly whitish deposit. Efficient **Cheney Thru-Wall Flashing** is the best way to safeguard against this condition.

Features of Cheney Flashing:

Fundamentally, Cheney Flashing functions in a very definite manner:

1st: It forms a positive mechanical key-bond in every direction within the mortar bed—vertically as well as laterally.

2d: It provides perfect drainage so that if moisture should penetrate a wall, it will drain quickly.

3d: It provides adequately for expansion and contraction.

4th: It has a water-tight, interlocking lap that requires no soldering.

5th: It has a stiff counterflashing face that hugs the wall tightly after the base flashing has been installed.

Sizes:

Cheney Thru-Wall Flashing comes in sheet form in widths from 6 to 60 inches (in even widths) and in nine special forms. The standard overall length of the sheets is 42 inches.

Cheney Flashing Installed in Cornice, Massachusetts Institute of Technology
After five years' exposure, the flashing remains in perfect condition. Note the interlocking lap

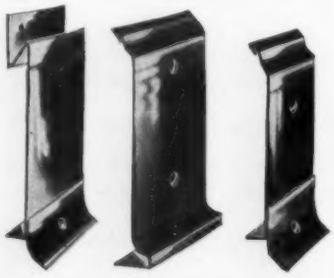
Complete catalog, information and specification data on Revere building products will be found in Sweet's 1939 Architectural Catalog.
Revere Roofing and Flashing—Section 6, Catalog 41.
Revere Pipe and Tubing—Section 27, Catalog 11.
Revere Architectural Shapes and Sheets—Section 13, Catalog 6.

Illustrated catalogs can be had by writing direct to Revere Copper and Brass Incorporated. Revere also offers, without obligation, the services of competent advisors to assist in individual problems.

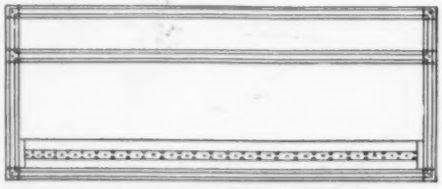
MILCOR STEEL COMPANY

Milwaukee, Wisconsin, 4153 W. Burnham St. — Canton, Ohio
Chicago, Illinois — Kansas City, Missouri — La Crosse, Wisconsin

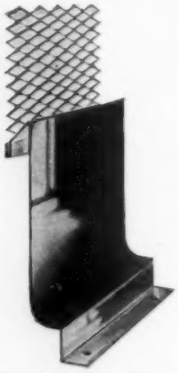
MILCOR INTERIOR METAL TRIM



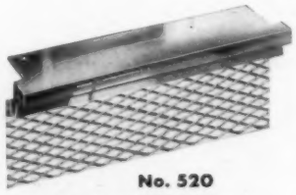
No. 631 No. 645 No. 643
Metal Bases Without Wings



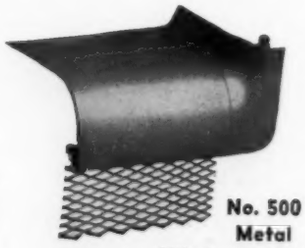
Practical Blackboard Design
Using Milcor Moulds



No. 600 Metal Base
With Expansion Wings



No. 520
Metal Window Stool
With Expansion Wings



No. 500
Metal
Window Stool

No. 762
Chair
Rail

No. 752
Chair
Rail

The Finest and Most Complete Line of Metal Trim Available

Milcor Metal Trim provides the best possible construction for school buildings. Permanence, fire-safety, and resistance to use and abuse are features which should be given prime consideration in the building of schools, and these are inherent advantages in the Milcor Line of Interior Metal Trim.

Every desirable type of metal window trim and stool may be found in the Milcor Line, and numerous different installations may be achieved by combining various designs, mouldings and bases. All Fittings are welded to the trim at the factory, an important, exclusive feature.

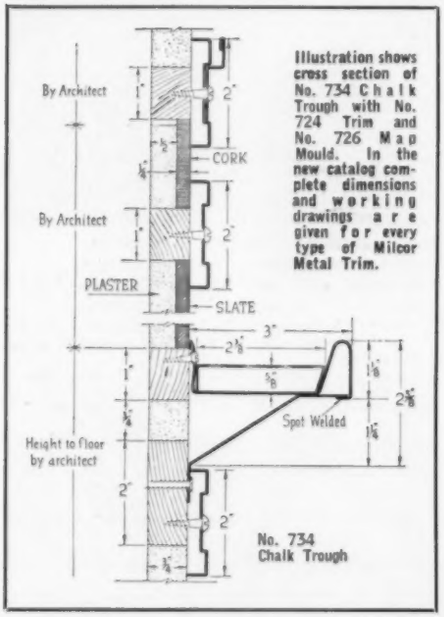


Illustration shows cross section of No. 734 Chalk Trough with No. 724 Trim and No. 726 Map Mould. In the new catalog complete dimensions and working drawings are given for every type of Milcor Metal Trim.

Milcor Metal Trim is attractive in appearance, sanitary, economical, easy to keep clean and to maintain. It is obviously so much better looking than the old heavy wood trim, that comparison is unnecessary. But even more important than its appearance are the many practical advantages which make it the ideal trim for schools.

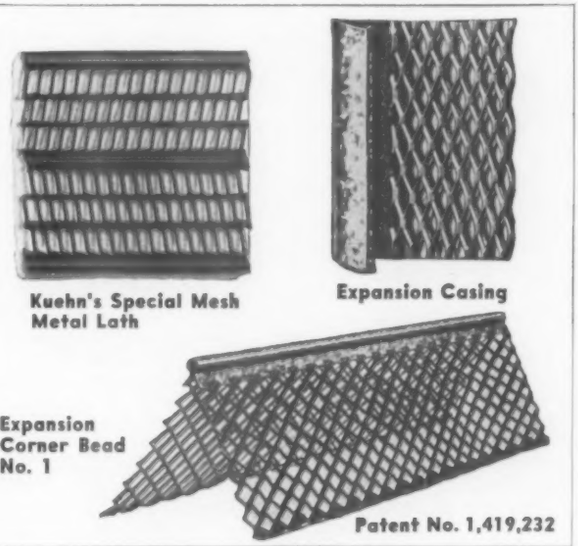
The Expansion Wing, which is a feature of many Milcor Products, provides a permanent plaster bond, preventing checking and cracking of plaster at vulnerable points. And in schools, especially, it is desirable to preserve the original plastered surface.

Products particularly adapted for school buildings are Metal Bases, Metal Cove Moulds, Metal Chair Rails, Metal Blackboard Moulds, and Metal Chalk Troughs.

Send for our new Catalog No. 100-B, Specification Manual

MILCOR PRODUCTS
Save with Steel — TUNCAN — ANACONDA Copper Alloy Steel

MILCOR PRODUCTS for SCHOOLS



There is no better plaster base for walls and ceilings of school buildings than metal lath. And there is no better metal lath than Kuehn's Specialmesh. Its scientifically designed mesh gives it a positive plaster grip. There is no plaster waste with this lath, and yet every inch of wall surface is locked permanently into place.

Expansion Casing provides a practical door and window trim. The flush-tight junction of wall and casing insures a sanitary finish, with no cracks to become clogged with dirt.

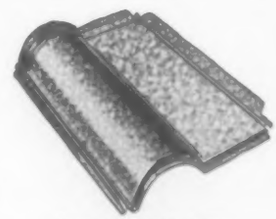
Milcor Expansion Corner Bead is made for outer and inner angles, and its precisely true nose makes a neat, safe, straight-lined corner. The expanded wing, an integral part of the bead, permits the plaster to key through and form a strong bond with the lath beneath, protecting against corner cracks either from blows or strain due to settling.

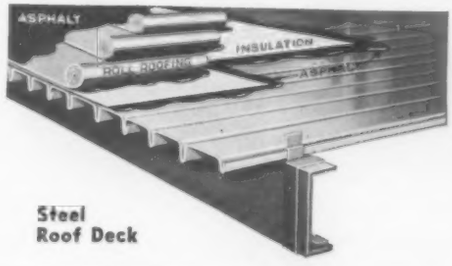
The Milcor "Nu-Air" is a steel top syphon Ventilator. Breakers and deflectors inside the wind band produce positive suction regardless of wind direction, and insure against back draft at all times. Its design takes into consideration all influencing conditions and compels it to function whenever and wherever there is air movement.

The Milcor "Spinner" Ventilator has great exhaust capacity. The slightest breeze keeps it operating efficiently. As the blades turn, the air in the ventilator head is expelled, creating a vacuum which draws the impure air from the building. Down drafts are an impossibility with this construction.

The Milcor Line of Skylights covers all types and sizes. We furnish recommendations to meet special requirements.

Send for literature describing and illustrating Milcor Ventilators and Skylights





Spanish Metal Tile is a popular roof for schools. It is light in weight and requires only a light supporting structure. It may be finished in any color desired and lends itself ideally to the general artistic scheme of the building. It is fireproof and lightning-proof.

There is an increasing use of Steel Roof Deck because of its many outstanding advantages. It is light in weight, simple to install, has a wide range of application, and is fire-safe. Any standard composition roofing may be applied over it. Our Engineering Department will supply all necessary details if roof plans are sent in.

Metal Ceilings are still the most practical material for remodeling school interiors. They are fire-safe, economical and durable; easily cleaned, and vibration, jolts or settling strains do not affect them. The Milcor Line of modern designs includes every desirable type. Send for new booklet.

THE RIC-WIL COMPANY

Underground Conduit Systems for Heating and Power Pipes

Union Commerce Building, Cleveland, Ohio

BRANCH OFFICES: New York, Chicago — AGENTS IN PRINCIPAL CITIES

REG. U. S. PAT. OFF.

RIC-WIL

PRODUCTS

Ric-wiL Interlocking Conduit and Base Drain Foundation, Tile and Cast Iron; Ric-wiL Unit Steam Main; "Dry-paC" Waterproof Asbestos Conduit Insulation.

Ric-wiL Interlocking Conduit

Ric-wiL Conduit is first quality, standard weight, vitrified glazed tile of the bell and spigot type.

It is shipped on the job in full round sections and split into top and bottom halves as used. Thickness of tile is reinforced to double strength at top and bottom. When installed, bell and special Loc-liP side joints are sealed with portland cement. Loc-liP joint (see illustrations) is shaped so that cement locks top and bottom halves permanently together in all directions, giving conduit extraordinary rigidity and strength. Leakage is practically impossible. Top and bottom halves are interchangeable (foolproof) and numbered in pairs so that companion pieces may be kept together.

Sections are all in 2-ft. lengths, sizes from 4 to 27-in. inside diameter. Every sixth section of conduit has an opening in the bottom half through which a pipe support of the roller type projects to carry the steam, hot water or oil pipes, thus making the pipe supports independent of the conduit itself, a desirable feature for this class of work.

Ric-wiL Interlocking Base Drain Foundation

Ric-wiL Base Drain Foundation is first quality vitrified glazed tile, so designed that it is both a base for supporting and lining up the conduit and drain for carrying away water which might otherwise accumulate around the conduit. Top of base drain has slot into which the bell of conduit fits, making sections of conduit and base drain stagger with each other to form a strong interlocking construction. Pipe support saddles rest on the side shoulders, which insure perfect alignment of pipes. Wide flat bottom of base drain makes a solid foundation. Free drainage area of the base drain is large and ample for every practical condition. Made in three sizes to support properly all conduit sizes.

Cast Iron Ric-wiL Conduit

For extra heavy duty under railroads or where conduit is subject to very heavy loads, Ric-wiL is made of cast iron. Has Loc-liP Joint and "interlox" with tile Ric-wiL—made for all 5 types described in next column. A special heavy duty tile base drain or a cast iron base drain is provided for use with Ric-wiL Cast Iron Conduit.

Three Selected Ric-wiL Types

PRODUCTS

Roller Pipe Supports; Alignment Guides; Manhole Covers; Asphalt Impregnated Filter Tape.

Five Systems to Meet All Conditions

Type F System—For steam heating, power pipes and superheated steam. A conduit that assures super-efficiency when insulated with Dry-paC (description below), or Ric-wiL No. 11 Filler, packed around pipes in closed construction.

Type SPC System—For steam heating, power pipes and superheated steam. Insulation is any standard make of sectional pipe covering, kind and thickness depending upon service to be rendered. Double drainage is provided in this type.

Type DA System—For hot water, oil transmission and condensation returns. Tile and insulation in one, the latter, a diatomaceous earth mixture of high insulating quality, moulded inside the tile and keyed in. This type insulates the pipes from surrounding ground but not from each other, making it specially adapted to carry oil and steam pipes together for oil transmission. Exceptionally easy to install.

Type DF System—For steam heating, power pipes and superheated steam. This is Type DA with the addition of Ric-wiL Asbestos Conduit Filler to be packed around pipes at a density specified by manufacturer. Filter is a good non-conductor which will not corrode the pipes nor shrink. Dry-paC furnished when specified.

Super-Strength Tile Conduit—To support any average traffic load, is also available. Details on request.

Dry-paC Waterproof Conduit Insulation

A high-grade long fibre asbestos insulation, processed so that it is permanently water repellant. Of unusually high efficiency and great natural strength, it will not slump down away from pipes and is non-corrosive. Sample will be sent gladly for testing.

Ric-wiL Pipe Supports

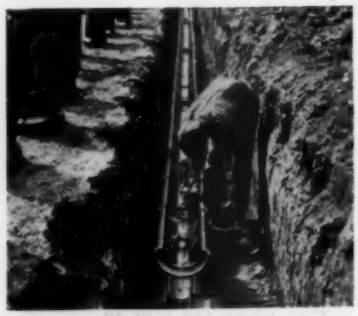
Standard pipe supports will carry from one to five or more pipes and are ordinarily spaced 12 ft. apart. They are strong, made of cast iron, rustproofed, and interlocked with the base drain foundation, imposing no load on the conduit itself.

Engineering Service

Full co-operation with architects and engineers; complete service details and installation instructions; installation supervision where desired.

Catalogues, test reports, typical specifications, etc., promptly on request.

Skidmore College, Saratoga Springs, N. Y.



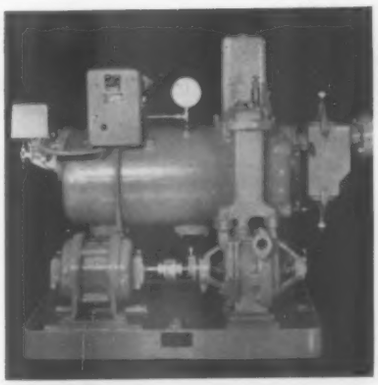
University of Kentucky, Lexington, Ky.

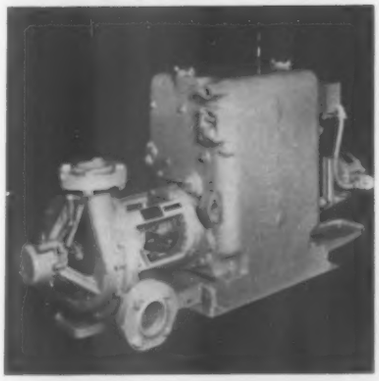
University of Washington, Seattle, Wash.

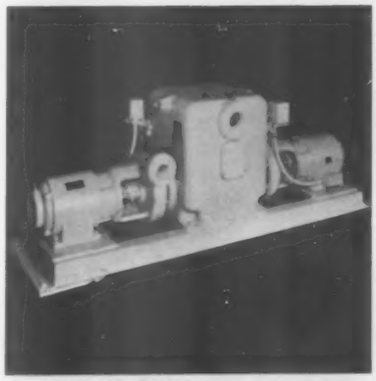
THE NASH ENGINEERING COMPANY

South Norwalk, Conn., U. S. A.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES







JENNINGS RETURN LINE VACUUM HEATING PUMPS

Standard with the heating industry for over sixteen years. They remove air and condensation from the return lines of vacuum steam heating systems, discharging the air to atmosphere and returning the water to the boiler.

Two independent units are combined in a single casing—an air unit and a water unit. Impellers of both are mounted on the same shaft. The pump is bronze fitted throughout.

Supplied either direct connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous or automatic operation against pressures up to 40 lbs. Supplied standard in capacities up to 300,000 sq. ft. E.D.R.

JENNINGS VAPOR TURBINE VACUUM HEATING PUMPS

The Jennings Vapor Turbine Heating Pump combines all of the advantages of the standard return line heating pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains on any system, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the safety and economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current. Furnished standard in capacities up to 150,000 sq. ft. E.D.R. Information on request.

CONDENSATION PUMP AND RECEIVER

Removes condensation from radiators in return line steam heating systems and pumps condensation back to the boiler.

They are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Bronze fitted throughout, with Tobin bronze shaft. Impeller is of special design adapted to handling hot water with highest efficiency.

Jennings Condensation Pumps are furnished in standard sizes with capacities ranging from 1½ to 225 g.p.m. of water, for serving from 1,000 to 150,000 sq. ft. equivalent direct radiation.

JENNINGS SUMP AND SEWAGE PUMPS AND SEWAGE EJECTORS

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing.

Capacities and heads to meet all requirements.

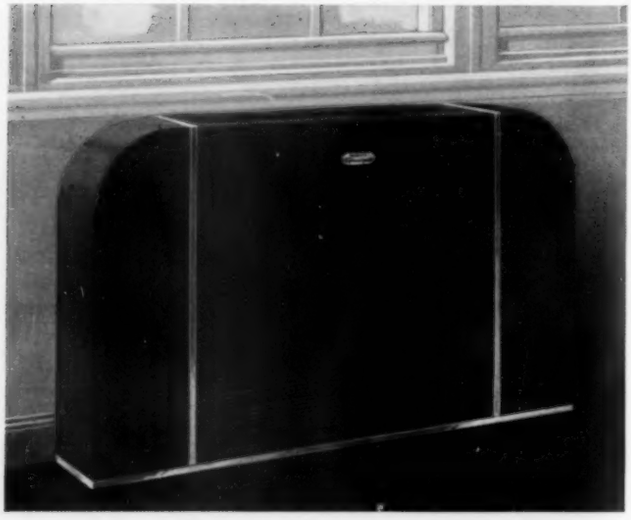
JOHN J. NESBITT, INC.

Manufacturers of

Heating, Ventilating and Air Conditioning Equipment

Holmesburg, Philadelphia, Pa.

11 Park Place, New York City



THE NESBITT SYNCRETIZER

has completely revolutionized standards of schoolroom heating and ventilating. Fully automatic, and doubly controlled by a room thermostat and an airstream thermostat, this advanced heating and ventilating unit harmonizes, or **syncretizes** room and airstream temperatures, thus producing Syncretized Air . . . constant spring weather indoors.

Fresh Air Without Drafts or Overheating

Nesbitt Syncretizers are adjustable, according to any state's requirements, to deliver all or part outdoor air, but always some outdoor air, to occupied classrooms. Nesbitts' insistence that outdoor air ventilation is regularly needed to maintain comfort and health and to abate odors has the weighty backing of nearly all state laws, of the American Society of Heating and Ventilating Engineers, and of the latest researches. The Air-Stream Minimum Temperature Control provides that all air taken from outdoors is first warmed to a safe minimum temperature, thus preventing drafts. The Room Temperature Control assures that the desired room temperature will be uniformly maintained, without permitting overheating.

Beautiful–Quiet–Economical

The Nesbitt Syncretizer is uniquely modern in appearance, yet its beauty is entirely conformable to schoolroom design. Tests have proved it to be the quietest of units. But the point which wins it greatest favor with school boards is its surpassing economy of fuel.

Widespread Acceptance

Today, in over 65,000 schoolrooms of the United States and Canada, more than two million girls and boys enjoy the health and comfort of vital air, properly filtered, tempered and distributed according to the best scientific knowledge, by heating and ventilating units manufactured by John J. Nesbitt, Inc., or its constituent, the Buckeye Blower Company.

Nesbitts' Answer to the "Orange-Crate Craze"

During the past year John J. Nesbitt, Inc., advanced an acceptable idea for doing away with the unsightly orange crates often used for storage purposes in schoolrooms. They suggested the use of built-in shelves and storage cabinets along the windows, integrated with Nesbitt Heating and Ventilating Units, thus bringing the school adequate storage facilities for the projects and materials that are a necessary part of today's curriculum.

To make the idea practicable the Nesbitt Syncretizer is provided, if desired, with special casings designed to effect an appearance of coherent beauty when combined with built-in storage units. Nesbitt Auxiliary Convectors are also available in exterior casings to suit the ensemble. The storage cabinets or shelving sections may be specially fabricated of wood or steel according to the architect's plans, or may be obtained in standard steel units of several manufacturers.

First to bring "Perpetual June" to the classroom through the introduction of Syncretizer heating and ventilating units, Nesbitts are again first in relating ventilator and radiator design to the needs of the modern classroom.

Unit Casings to fit with Storage Units eliminate unsightly orange-crate shelves

Nesbitts will gladly co-operate with any school board or architect in embodying this practical idea in the construction of a new school or the remodeling of an old one. Full particulars will be mailed on request—Publication No. 225, Section G.

NESBITT Syncretized Air

PERPETUAL JUNE IN THE CLASSROOM

Nesbitt Syncretizers are sold by American Blower Corporation, and John J. Nesbitt, Inc. Complete information is contained in Publication No. 231. For engineering data, Publication No. 225.

B. F. STURTEVANT COMPANY

Heating, Ventilating, Air Conditioning and Vacuum Cleaning Equipment

MAIN OFFICE AND WORKS

Hyde Park, Boston, Mass.

SALES ENGINEERING OFFICES

Akron, Ohio	Chicago, Ill.	Greensboro, N. C.	Louisville, Ky.	New York, N. Y.	San Francisco, Calif.
Albany, N. Y.	Cincinnati, Ohio	Hartford, Conn.	Los Angeles, Calif.	Omaha, Neb.	Seattle, Wash.
Atlanta, Ga.	Cleveland, Ohio	Indianapolis, Ind.	Mansfield, Ohio	Phoenix, Ariz.	Spokane, Wash.
Baltimore, Md.	Columbus, Ohio	Jacksonville, Fla.	Milwaukee, Wis.	Pittsburgh, Pa.	Springfield, Mass.
Boston, Mass.	Detroit, Mich.	Kansas City, Mo.	Minneapolis, Minn.	Portland, Ore.	Syracuse, N. Y.
Buffalo, N. Y.	El Paso, Tex.	Little Rock, Ark.	Newark, N. J.	St. Louis, Mo.	Toledo, Ohio
Camden, N. J.	Grand Rapids, Mich.			Salt Lake City, Utah	Washington, D. C.

PLANTS LOCATED AT

Hyde Park, Boston, Mass. Sturtevant, Wis. Framingham, Mass. Camden, N. J. Berkeley, Calif. Galt, Ont.

B. F. Sturtevant Company of Canada, Ltd., Galt, Ont.: Sales Offices in Toronto and Montreal, and representatives in principal Canadian Cities

Representative: **A. M. Lockett & Co., Ltd.**—New Orleans, La., Houston, Tex., Galveston, Tex., and Dallas, Tex.

Mexican Representative: **E. N. MacKINNEY,** Ingeniero, Gaute 8, Suite 42, Mexico, D. F.

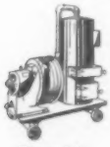
The Cooling and Air Conditioning Division of B. F. Sturtevant Company, Hyde Park, Boston., Mass.

Atlanta, Ga.; Camden, N. J.; Chicago, Ill.; Greensboro, N. C.; Los Angeles, Calif.; New York, N. Y.

UNIT VENTILATOR

A combined steam heating and ventilating unit widely used in schools and other places. Finished in duco of any standard color. Stainless steel trim.

VACUUM CLEANERS



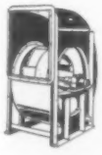
Portable

Central Systems

Sturtevant Vacuum Cleaners are made in both portable and stationary Central System types and in a variety of sizes to meet every school building need.

Features: Quiet operating vacuum producers, high suction for rapid cleaning under all conditions; tools designed individually for specific cleaning operations. Central Systems include piping recommendations to insure correct operation of the system.

SILENTVANE FAN



Backwardly curved blade type. A ventilating fan to meet the most exacting specifications, where very high efficiency and exceptionally low power consumption are required.

MULTIVANE FAN

Forwardly curved blade type. A highly efficient centrifugal ventilating fan of sturdy construction to meet the general run of ventilating requirements.

REXVANE FAN

The modern paddle wheel. Correct inlet blade curvature and stream line shrouding retain all good features of the old paddle wheel and greatly increase capacity.

Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work

CONVERTIBLE MULTIVANE FAN

This is a low speed centrifugal type fan with convertible and reversible housing, permitting quick conversion to any horizontal or vertical discharge.

VENTILATING SET

Direct connected; motor driven. For use with ducts, in ventilating small rooms, laboratory hoods and, in general, any room up to 10,000 cu. ft. contents.

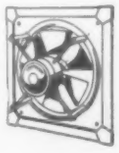
AIR WASHER

Built in several types to meet varying requirements in cleaning, cooling, dehumidifying and humidifying air.

FILTICOOLER

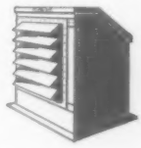
A compact, highly efficient, sectional type air washer. For filtering, washing, humidifying, cooling, and dehumidifying. Available in a range of sizes.

PROPELLER FAN



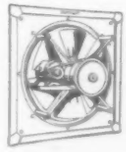
Built in fan sizes from 12 up to 45 in. Electric motors are available for both alternating and direct current, in wide variety of voltages.

PENT HOUSE



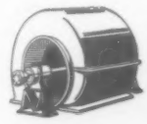
Sheet steel construction, with angle-iron framework. Includes automatic shutter. Made in range of sizes for Sturtevant Propeller Fans.

ATTIC FAN



A propeller type fan for installation in the attic, for cooling and ventilating. Range of sizes. Motors for various voltages, for a-c. and d-c.

MECHANICAL DRAFT FANS



Forced and induced draft fans to meet any need. Can be furnished with Sturtevant reduction gears and steam turbine, motor or engine drive.

PRESSURE BLOWER

A small, compact forced draft fan, with direct connected electric motor, for coal burning heaters in schools and other buildings.

SUSPENDED "SPEED HEATER"

Propeller fan type, for wall or ceiling installation. Fin type heating element. For steam pressures up to 200 lbs., capacities up to 300,000 B.t.u.

REXVANE SPEED HEATERS

Centrifugal fan type for floor, wall, or ceiling installation. Fin type heating element. For steam pressures up to 200 lbs.. capacities up to 1,421,000 B.t.u.

THE POWERS REGULATOR COMPANY

47 Years of Temperature and Humidity Control

Chicago
2724 Greenview Avenue

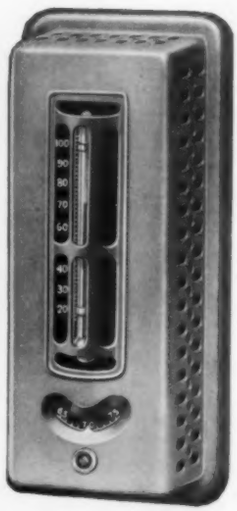
OFFICES IN 47 CITIES
See Your Phone Directory

New York City
231 E. 46th Street

AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

For Heating, Ventilating, and Air Conditioning Systems

At Harvard, Yale, Princeton, Vassar, Wellesley and hundreds of other prominent educational institutions will be found buildings equipped with the Powers Pneumatic System of Automatic Temperature and Humidity Control.



Forty-seven years of experience in developing and installing automatic control for heating, ventilating and air conditioning equipment in all types of old and new buildings qualify us to assist school executives, architects, and engineers on any problem of temperature and humidity regulation.

Powers pneumatic systems often cost more than other types but they are worth more because: they often give 15 to 20 years of accurate and dependable control without repair expense.

Powers thermostats do not get out of adjustment permitting UNDER-heating and OVER-heating which not only wastes fuel but causes discomfort. Neither the extreme heat of Summer, sub-zero temperatures of Winter, nor the vibrations in some buildings, change their adjustment. They need no annual overhauling or adjustment, and the true gradual action of their powerful vapor disc controls valves or dampers gradually—resulting in exceedingly accurate regulation.

Write for Estimate. Let one of our engineers study your requirements and submit an estimate of the cost of installing the type of control best suited to your needs.

Self-operated Controls. We also manufacture a very complete line of self-operating temperature regulators that do not require electricity or compressed air for their operation. **Write for bulletins,** if interested.

Some of the many Schools, Colleges and Universities using Powers Automatic Temperature Control

Amherst College
University of Arkansas
Ball State Teachers College, Muncie, Ind.
Bowdoin College
California Institute of Technology
University of Chicago
Converse College
Creighton University
Dartmouth College
Georgetown University
University of Georgia
Harvard University
Holy Cross College
University of Illinois
International Y. M. C. A. College, Springfield, Mass.
Iowa State College
University of Kansas City
Lafayette College
Lehigh University
Louisiana State University
University of Maryland
Massachusetts Institute of Technology
Massachusetts State College, Amherst, Mass.
University of Michigan
Midland College, Fremont, Neb.
University of Missouri
University of New Hampshire
Notre Dame University, South Bend, Ind.
University of Oklahoma
Oklahoma Agr. and Mech. College
Our Lady of the Elms College, Chicopee, Mass.
Purdue University
Radcliffe College
Sacred Heart College, Cambridge, Mass.
St. Joseph's College, Hays, Kansas
St. Joseph's College, West Hartford, Conn.
Smith College
State Normal College, Oswego, N. Y.
State Teachers College, Bridgewater, Mass.
State Teachers College, Lowell, Mass.
State Teachers College, Springfield, Mass.
Tarkio College, Tarkio, Mo.
Vassar College
University of Washington
Wayne University
Wellesley College
Wesleyan College
Western Reserve University
Wichita University
Williams College
Yale University
Yale University Anthropoid Station

and THOUSANDS OF PROMINENT GRADE, HIGH SCHOOLS AND PAROCHIAL SCHOOLS

SAFETY WATER MIXING VALVES

Safety Shower Mixers

A complete line of both pressure equalizing valve and thermostatic shower mixers that protect bathers from scalding temperatures caused by pressure and temperature fluctuations in pipe lines, and prevent sudden "shots" of hot or cold water. Maximum temperature of delivery can be limited.

For Individual Showers

Thermostatic Water Controller

For group or gang showers, zone or progressive showers. Will mix hot and cold in quantities up to 100 gallons per minute and deliver at any temperature desired. Delivery temperature is not affected by temperature or pressure changes in the supply lines.

For Group, Gang or Progressive Showers

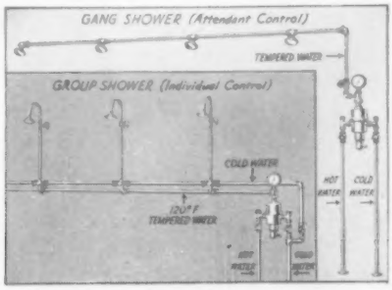
Group or Gang Shower Control—Powers Thermostatic Water Controllers are used for the control of shower baths in groups varying in size from 4 to 20 stalls. They may be used to establish a maximum temperature of hot water supply to protect the entire group from danger of scalding, or to place the entire group of showers under the control of an attendant.

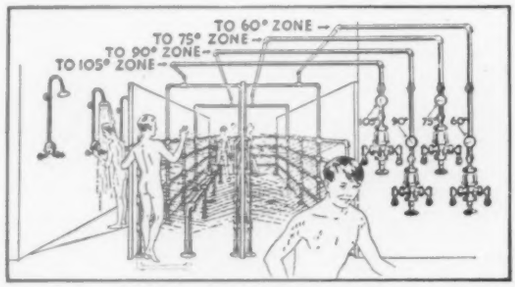
Individual Shower Control is best suited for adults as it permits each bather to individually adjust the temperature of his shower while the hot water is kept at a safe maximum temperature.

Attendant Control is best suited for the bathing of children in schools, institutions, etc., as the temperature of the entire group of showers is adjusted by one individual.

Zone or Progressive Showers—Where compulsory bathing is required before entering swimming pools, lane showers are divided into four zones, each controlled by a Powers Controller. First zone is maintained at 105° F.; second at 90° F.; third at 75° F.; and fourth at 60° F. Because of its efficiency and its hygienic and sanitary advantage, this type of shower is rapidly increasing in popularity.

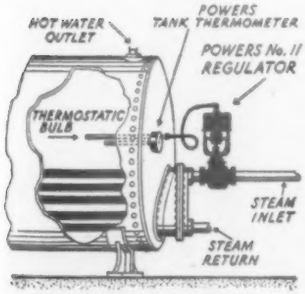
Write today for new 32-page Bulletin No. 258 which shows photographs of a variety of modern shower installations. It gives helpful advice in laying out shower rooms and completely describes Powers Safety Water Mixing Valves.





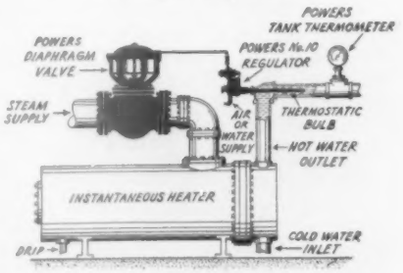
TEMPERATURE CONTROL FOR STEAM HEATED HOT WATER HEATERS

Self-operated



The most complete line of money saving regulators for this purpose. Often pay for themselves during the first year and give dependable control for 15 to 20 years. All steam valve sizes up to 10 inches. **Write for Bulletin No. 2035.**

Compressed Air or Water Pressure Operated



W. F. HIRSCHMAN CO., INC.

Buffalo, New York — New York, N. Y.

WARREN WEBSTER & COMPANY

-since 1888 Webster Systems of Steam Heating

HOME OFFICE and FACTORY—Camden, N. J.

Pioneers of Vacuum Steam Heating

REPRESENTATIVES IN 60 PRINCIPAL U. S. CITIES

SKIDMORE COLLEGE CUT FUEL BUDGET BY MODERNIZATION

Saratoga Springs, N. Y.—Nineteen Skidmore College buildings, controlled as regards heating from one central point, are burning approximately 22 per cent less fuel every month as the result of a Webster heating modernization program carried out during the fall of 1933.

This institution has slashed its yearly heating budget nearly $4,000. The entire cost of modernization was liquidated in less than four heating seasons.

Webster Moderator Control was the choice of Skidmore College officials because of its adequacy in meeting the diverse heating needs of lecture rooms, dormitories, reading rooms, science laboratories, gymnasium and swimming pool.

"Perfectly balanced heating was not accomplished over night," Dr. John R. Hobbie, director of buildings and plant, points out. "Warren Webster & Company kept the installation under careful observation until all engineering difficulties were corrected and the system was operating at maximum efficiency.

"Despite the handicap of unusually severe weather, steam savings during the first complete heating season totaled 7,679,000 lbs. For the first 5 months of the 1934-35 season, we saved 5,943,000 lbs."

Savings were computed on the difference between the current monthly steam cost and past monthly steam consumption over a three-year period, after correction for degree day differences. The operating schedule provides approximately 15 hours of heating service daily for average winter weather.

Sharply reduced incomes have lately forced most educational institutions to abandon long-term borrowing in favor of pay-as-you-go programs. The fact that heating modernization is more likely to be self-liquidating than any other building improvement has stimulated activity in this field.

"In addition," observes Dr. Hobbie, "the elimination of discomforts and distractions is an important contribution to the health and comfort of faculty and students."

SPEAKMAN COMPANY

Wilmington, Delaware, U. S. A.

SHOWERS AND SHOWER HEADS

S-1100

S-1100 — SPEAKMAN Built-in Mixometer Shower. Size, ½ inch. Mixometer with renewable seats and encased washers. Anystream Self-Cleaning Head with lock-shield control. Short, 30° angle flanged shower arm drilled for expansion or through bolts

S-1120—Same as S-1100 but with Hot and Cold Hi-Seat Valves with unions

S-1160 — SPEAKMAN Columbia Shower. Size, ½ inch. Compression valves with cast wall lugs, renewable seats, swivel discs and encased washers. Supplies to overhead 36 inches long. Horizontal discharge arm setting head 15 inches off center. Anystream Self-Cleaning Head with lock-shield control set at 30° angle

S-1140—Same as S-1160 but with Mixometer valve with cast wall lugs

S-1160

Normal Spray

Needle Spray

Flood Spray

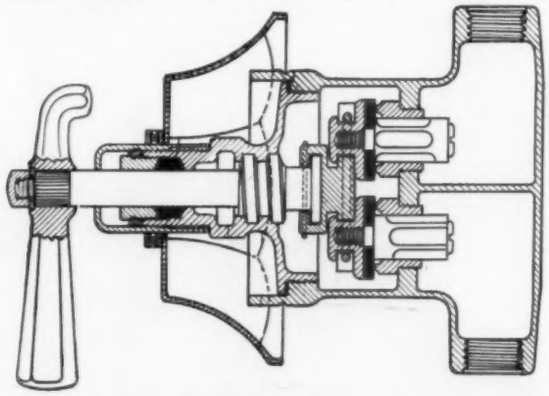
S-2250—SPEAKMAN (Patented) Anystream Self-Cleaning Shower Head with lever handle control with ½-inch I. P. inlet. Ball joint not furnished unless specified

S-2260—SPEAKMAN Wall Type Anystream Self-Cleaning Shower Head

Speakman Company makes a complete line of showers, shower heads and plumbing fixtures for all classes of installations. Fixtures described and illustrated on these pages are designed for use in schools, colleges, universities and institutions. In designing this equipment, particular attention has been given to water economy, as well as cost upkeep.

The Anystream Self-Cleaning and Adjusta-Spray Shower Heads eliminate the annoyance caused by stopped-up shower heads. Both have self-cleaning features with variable spray adjustment. Instead of holes in the face of the Anystream Self-Cleaning Head, plungers with tapered grooves give full, round, unbroken sprays. By turning the handle the bather may select a normal, needle, or flood shower spray. The flood spray flushes out any dirt or sediment.

On installations where funds available will not permit the use of the Anystream Self-Cleaning Head, we recommend the Adjusta-Spray Head. The milled face discharges water at three different angles, insuring a well distributed spray—not a hollow-centered, cone-shaped spray.



The Speakman Mixometer

The name "Mixometer" means to mix and measure. The Mixometer mixes hot and cold water to a mechanical exactness and measures the volume so that an equal amount of water passes through the shower at all temperatures. With the Mixometer, cold water follows the first fractional turn of the handle, then warm, and finally hot, if desired; when properly installed it is impossible to get hot water first.

S-2255—SPEAKMAN Anystream Self-Cleaning Shower Head with ½-inch I. P. female inlet and lock-shield arranged to operate by a key

S-2410—SPEAKMAN (Patented) Adjusta-Spray Shower Head with integral ball joint having ½-inch I. P. inlet

S-2420 — Same as S-2410 but with lever handle volume control

S-2450—SPEAKMAN Wall Type Adjusta-Spray Shower Head. ½-inch I. P. inlet in back or side

K-9000 — SPEAKMAN Si-Flo Closet Flush Valve. Has 1-inch capped angle stop for right or left inlet, wall flange, metal oscillating handle, flush connection, spud coupling nut and flange for 1½-inch top supply (Patented)

K-9082 — SPEAKMAN Si-Flo Urinal Flush Valve for stalls. Has ½-inch capped angle stop for right or left inlet, wall flange, metal oscillating handle, flush connection, spud coupling nut and flange for ¾-inch top supply

Speakman Si-Flo Flush Valve

The Si-Flo Flush Valve eliminates all noises heretofore associated with flush valves, because these noises are prevented from forming. The Si-Flo Flush Valve is quiet in operation, is efficient, and works equally as well under high or low water pressure. This flush valve roughs in on standard measurements and can be used for new installations or to replace noisy flush valves. It can be furnished with right, left or back supply; built in the wall or seat-action type. The Si-Flo Flush Valve can also be supplied for urinals and metering showers. See K-2 Catalog for our complete line of Si-Flo Flush Valves.

The Compact Piston Unit

The Si-Flo Flush Valve has no metal to metal wearing parts. The piston is made of a hydraulically moulded composition noted for its long wearing qualities and resistance to solvents, alkalis, and acids. The gaskets are made of the best grade moulded rubber composition, and are positively non-curling. The cup leather is hydraulically formed and treated so that it will retain its shape and pliability indefinitely.

This unit can be replaced in five minutes at nominal cost.

Anti-Syphon Devices

Anti-Syphon stop will be supplied without extra charge when sanitary code requires it. Where Anti-Syphon stop is angle pattern, state whether it is to rough-in right or left. Where Anti-Syphon Stop will not meet code, a Back Syphon Preventer can be furnished at slight extra cost.

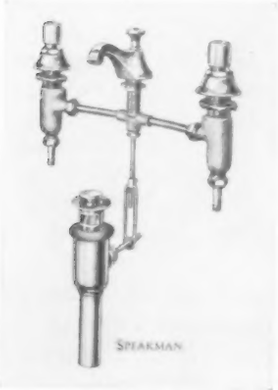
Piston Unit

The Si-Flo Flush Valve piston unit, noted for its long-wearing qualities, contains no metal to metal wearing parts. It can be replaced in five minutes at a nominal cost

K-9056 — Si-Flo Seat Action Closet Flush Valve with 1-inch straight stop, flush connection for 1½-inch top supply, adjustable bar check-hinge, black hard rubber open-front seat less cover

Sink, Bath and Lavatory Fixtures

SPEAKMAN sink, bath and lavatory fixtures are designed to give the maximum of service. Every fixture is accurately machined and thoroughly tested under high water pressure. All valve parts subject to wear, including seats, are renewable. A swivel disc encasing the washer distributes wear on washer and seat. Monel metal washer-retaining screws are used because of their resistance to the corrosive action of certain types of water.



S-4150

S-4150 — SPEAKMAN Combination Push-Button Metering Lavatory Fixture (Patent Pending). External volume adjustment. Non-clogging by-pass. Non-hammering renewable operating unit. ¼-inch threaded tail pieces. Pop-up drain with 1¼-inch O. D. tail piece

S-4700

S-4700 — SPEAKMAN Graceline Sink Fixture. ½-inch male eccentric connections with adjustable threaded flanges. Renewable hub, stuffing box, monel metal renewable seats, swivel discs, encased washers and monel metal washer-screws. Inlets 8 inches center to center

S-4710—Same as S-4700 but with transfer valve, hose and spray

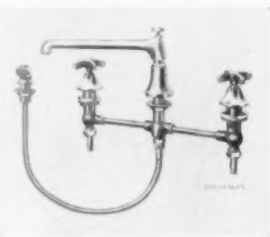
S-4320—SPEAKMAN Push-Button Self-Closing Metering Basin Faucet (Patent Pending). External volume adjustment. Non-clogging by-pass. Non-hammering renewable operating unit. ¼-inch threaded tail pieces

A hex wrench is furnished with this faucet for adjusting

S-4320

S-4740—SPEAKMAN Deck Type Sink Fixture with transfer valve, hose and spray. Elevated swinging nozzle 8½ inches long. Valves with monel metal renewable seats, swivel discs, encased washers, monel metal washer-screws and ¼-inch threaded tail pieces

S-4750—Same as S-4740 but less transfer valve, hose and spray



S-4740

CRANE CO.

Valves, Fittings, Pipe, Plumbing, Heating, Pumps

General Offices: 836 South Michigan Avenue, Chicago, Illinois

NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS, PLUMBING AND HEATING CONTRACTORS

PROVIDE YOUR SCHOOL WITH MODERN SANITATION

Choose Crane Dependable Plumbing

Whether you are building or modernizing a school, provision of adequate sanitary facilities is of utmost importance. In quality as well as quantity, the standards of today must be met—the needs of tomorrow considered.

School sanitation problems are readily solved with Crane-Equipment. Its design gives special attention to those features most vital in school installations. It provides:

- ***(a) Maximum protection against contamination and the spread of water-borne diseases.***
- ***(b) Durable construction to withstand the severity of school service—to assure lasting and economical performance.***

The essentials of modern school sanitation are frankly discussed in Crane's booklet "The Importance of Sanitary Equipment in Schools." Based upon intensive research and Crane's long experience in this field, it is an authoritative guide in the selection of plumbing equipment for the entire school. If you do not have a copy, write us today. You'll find it invaluable.

CRANE

BRADLEY WASHFOUNTAIN CO.

2231 West Michigan St., Milwaukee, Wis.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

36″ Dia. Foot-controlled Semi-circular Enameled Iron Washfountain

NEW WASHFOUNTAIN FOR SCHOOLS

The fixture illustrated above is a new Bradley Washfountain designed expressly to bring the advantages of group washing to the average school washroom. It measures 36″ across, is of the semi-circular, wall type, accommodates three users simultaneously, may be had in enameled iron or stainless steel, and in hand or foot-controlled models.

OTHER BRADLEY WASHFOUNTAINS

Other Bradley Washfountains are available in circular, as well as semi-circular designs, in precast marble and stone, enameled iron and stainless steel, in 54″ and 36″ diameter sizes serving ten, six or three users at the same time and in a wide range of types and prices. Precast fountains are particularly popular for use in shops.

54″ Dia. Circular Cast Stone Washfountain

WASHFOUNTAIN ADVANTAGES

Features of Bradley Washfountains which make them especially desirable for schools are: improved sanitation, because each user washes in running water; low-cost installation, since only three plumbing connections are necessary; average saving of 25% in floor space and 80% in water consumption; attractive appearance, extraordinary durability and practically no up-keep expense.

Circular "5-In-A-Group" Shower with Receptors

GROUP SHOWERS WITH RECEPTORS

Bradley Group Showers with Receptors as illustrated above have many outstanding features which make them ideal for school service. In addition to all the advantages of other Bradley Showers, they are completely self-contained, can be installed on any type of floor, including wood, improve sanitation, and increase safety by means of anti-skid surfaces.

STANDARD BRADLEY SHOWERS

Semi-circular "3-In-A-Group" Shower

Standard Bradley Showers are installed on a specially constructed floor. They are available in circular and semi-circular models accommodating five and three users respectively, measure 84″ in diameter, and require but three plumbing connections. In addition, they practically eliminate the scalding hazard so common in batteries of ordinary single showers, are durably constructed, attractive in appearance, and are used extensively by schools.

OTHER BRADLEY FIXTURES

In addition to Washfountains and Group Showers, the Bradley line includes Drinking Fountains, Showers with Dressing Rooms, Foot-Fountains and Street and Playground Showers.

Overhead view of Bradley Washfountain in use

A Bradley Equipped Washroom

Overhead view of "5-In-A-Group" Shower in use

THE HALSEY W. TAYLOR CO.

Main Office and Factory: 137 North Street, N. W., Warren, Ohio

OFFICES IN THE FOLLOWING CITIES

Boston, Mass.	Buffalo, N. Y.	Newport News, Va.	Denver, Colo.	Los Angeles, Calif.
Cincinnati, Ohio	Detroit, Mich.	Washington, D. C.	Rochester, N. Y.	Chattanooga, Tenn
Atlanta, Ga.	Dallas, Texas	New York, N. Y.	Chicago, Ill.	Seattle, Wash.
Philadelphia, Pa.	San Francisco, Calif.	Albany, N. Y.	St. Louis, Mo.	Cleveland, Ohio
Pittsburgh, Pa.	Baltimore, Md.	Memphis, Tenn.	Minneapolis, Minn.	Des Moines, Iowa
	New Orleans, La.	Nashville, Tenn.	Kansas City, Mo.	

PRODUCTS

Halsey Taylor Sanitary Drinking Fountains and also Electric as well as Ice Coolers. Patented Automatic Stream Control, Two-Stream Projector, Non-Squirting Features.

DRINKING WATER SERVICE

Halsey Taylor Drinking Fountains are made and sold by the largest organization devoted exclusively to that line of manufacture. Our sole aim and purpose is to produce the best fountain for any need, and our entire resources and facilities are pointed toward that end. We aim to sell a service rather than a mere fountain and invite architects or builders to write us relative to any problems that may arise in connection with drinking-water provision.

These fountains embody distinctive features, resulting in the following advantages:

FEATURES

(1) Practical Automatic Stream Control—An automatic device maintains a constant height in the drinking stream, even though the line pressure may vary 50 pounds. The stream is never too high, never too low.

(2) Ideal Drinking Mound—The 2-stream projector was designed for and adopted by the Government during the war. This exclusive design makes the side stream really practical, and removes the objections found with ordinary sidestream foundations because of their hoselike stream.

(3) Absolute Sanitation—The drinking mound is formed by the converging of two streams of water, thus setting up an interference forming a localized drinking mound which makes it impractical to drink from any other point, therefore sanitary in the extreme. The finger or lips cannot come in contact with or contaminate the source of supply. It is absolutely impossible to squirt the water.

FOR ANY FEED

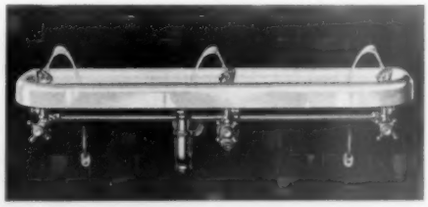
You will find fountains in the Halsey Taylor line to meet any requirements.

Halsey Taylor exclusive features are now available in cabinets for use with various types of electric refrigeration units.

Write for special literature.

NO. 2616

Illustrations show a few of vitreous china fixtures with patented Halsey Taylor features



NO. 2703

NO. 2601

NO. 2605

NO. 2609

CHOICE OF COLOR

All vitreous china fixtures shown in this catalog can be furnished in various colors to match the woodwork, marble, or interior trim.

MARBLE FOUNTAINS

Send for roughing-in measurements of Halsey Taylor fittings for marble, or terra cotta wall and pedestal fountains.

BLUE PRINTS

Blue prints giving details will be furnished for any fixtures shown.

The complete Halsey Taylor line of pedestal, wall and battery types is illustrated and described in our latest Catalog. Send for your copy.

KERNER INCINERATOR COMPANY

3701 North Richards Street, Milwaukee, Wisconsin

OFFICES AND AGENCIES IN OVER 150 CITIES

PRODUCTS

KERNERATORS: For the prompt, safe, and sanitary disposal of all kinds of rubbish (including garbage) by incineration. Manufactured in four types.

Flue-fed	Retort (downdraft)
Basement-fed	Gas-fired ("Commercial")

The characteristics and advantages of each type are described below.

SCHOOL BUILDING PROBLEMS SOLVED BY KERNERATORS

SAFETY

The KERNERATOR, by providing a place designed for burning all waste eliminates the fire hazard and the smoke panic hazard inherent in the collection and storage of such waste. Even baling paper sorted from other waste is a doubtful economy. This is especially so when weighed against the possible hazard.

SANITATION AND HYGIENE

The KERNERATOR provides a convenient, sanitary, and economical method for handling all sweepings, lunch remains, garbage from cafeteria (if there is one), and all promiscuous waste.

Flues may be so located that one set of hopper doors will open into the girls' washrooms. This idea has been adopted by a number of Architects (names upon request) with very satisfactory results in actual operation.

The KERNERATOR provides a means for the disposal of sanitary waste from girls' washrooms. In so doing the KERNERATOR eliminates both the disturbance to routine and the damage and maintenance expense of clogged drains.

ECONOMY

The KERNERATOR eliminates the expense of labor, time, and equipment in handling, storing and transporting rubbish and garbage; the necessity of daily collections of waste paper and sweepings—frequent trucking. It also cuts the cost of plumbing repairs due to drains stopped by sanitary waste in girls' washrooms.

APPLICATION

Flue-fed

This type offers the utmost in convenience, labor saving, and safety through immediate disposal of waste.

The incinerator chamber is located in the basement and the chimney which serves it acts as a chute for material deposited through the hopper doors on the floors above, and also as a flue to carry off the products of combustion when the incinerator is in operation.

The hopper doors located on upper floors assure maximum convenience by providing a means for the disposal of waste near the point of origin.

This type may also be fed from the basement direct into the incinerator chamber.

Basement-fed

In existing buildings where no flue is available either large enough to provide a fallway or located conveniently for hopper doors, a basement-fed KERNERATOR provides all of the advantages except the hopper door convenience described above.

Retort (downdraft)

This type is intended for special burning problems involving the use of fuel either in the form of dry waste or commercial fuel to burn waste which is too wet to burn without the aid of combustible waste or fuel.

Commercial

Where a compact, portable unit is desired for burning only garbage, the Kernerator Commercial is available. It is primarily a slow burning garbage destructor, using commercial fuel. Most economical and efficient operation is achieved by the use of soft coal, although gas can be used as fuel. Each unit is capable of handling the drained but wet garbage from 600 to 800 cafeteria meals per day.

REPRESENTATION

The KERNERATOR is made and sold by the pioneer in the flue-fed incineration field with agents located in all principal cities. Satisfactory operation is guaranteed by a financially sound organization having a stable, trained corps of incinerator experts with a wide experience in school installations.

FURTHER INFORMATION

When you are planning a school building, may we send a specialist to discuss your waste disposal problems? He will be glad to recommend the proper type and size of equipment depending upon the number of rooms, number of pupils, and the height of the building.

Central High School, Fort Worth, Texas
W. G. Clarkson Co., Architects

Roxbury Latin School, West Roxbury, Boston, Mass.
Perry, Shaw & Hepburn, Architects

CORNING GLASS WORKS

718 Fifth Avenue
New York

Corning, New York

Merchandise Mart
Chicago

ILLUMINATING AND OPTICAL DIVISION

SCHOOL LIGHTING PRACTICE

Why Use Artificial Lighting?

At first glance, since schools are largely used in the daytime, artificial lighting might be considered a needless expense, but an investigation of weather reports shows that in some localities natural lighting is inadequate for over 50% of the school hours. Further investigation shows that even on bright sunny days there is not always sufficient daylight illumination in all portions of the classroom.

Psychologists tell us that 87% of our impressions are received through the eyes. Inadequate illumination impedes education. Artificial illumination is needed to supplement natural illumination during the day and to make the schools useful and valuable at night; to improve scholarship and to check development of eye strain and defective vision among school children. Good lighting makes the schools so much more efficient.

How Much Light to Use?

This is largely an economic problem. Our eyes evolved outdoors under natural lighting conditions where light values ranged in hundreds of foot candles (units of illumination). Our vision is best under these lighting values which are far higher than we can afford to create indoors today. The values recommended must be a compromise between desirable amounts and practical costs. It is interesting to note that as costs have been reduced higher lighting values have been feasible and are being used. The new school code "The American Recommended Practice of School Lighting" released with the approval of the American Standards Association gives recommendations which have proved to be highly practical under today's costs. These recommendations vary depending upon the severity of the visual task, as noted in the following table:

Location	Minimum Operating Foot-candles of General Illumination
Classrooms—on desks and blackboards; study halls, lecture rooms, libraries—on desks and tables...	15
Offices—on desks	15
Sewing rooms, drafting rooms, art rooms and other rooms where fine detail work is to be done—on the work	25
Shops, laboratories—on the work	15
Gymnasiums—main exercising floor, wrestling, playrooms, swimming pools, basketball, handball, boxing	15
Auditoriums, assembly rooms, cafeterias and other similar rooms not used for study	6
Locker rooms, corridors, stairs, passageways, toilets and all indoor areas traversed by students	4
Sight-saving classrooms—on desks and blackboards	30

For good lighting in your school we highly endorse these values as minimum.

Quality of Light

The quality of lighting is as important as quantity. Glare, diffusion, composition and distribution have significant effects on the seeing process and should be given due consideration. Glare is brightness or contrast within the field of vision which can cause discomfort, annoyance or eye fatigue. For comfortable vision it has been found that no part of the lighting unit within the field of vision should exceed 2.5 candle power per square inch (units of brightness). The diffusion and distribution of light should be such that the minimum of shadows are cast over the work.

Light colored walls and white or very lightly tinted ceilings materially help to relieve contrasts and improve the quality of any lighting system.

The Cost of Good Lighting

Good lighting is inexpensive as it often more than pays for itself. Studies have shown that good lighting can improve student achievement and can lessen failures and repeats. Every failure or repeat creates a direct financial and an indirect economic and social loss which may far offset the difference in cost between adequate and poor illumination. Beyond this, there is a gain due to greater student achievement which cannot be measured.

The actual cost of lighting can be divided into three parts, the initial cost of the luminaire, power cost and maintenance cost. The following example (assuming a 300 watt classroom unit and a 10 year minimum life) serves to illustrate the relative importance of these three elements of cost.

	Basis for Estimate	Total Cost	Percentage of Cost
Initial Cost of Luminaire	Quality (Bid Purchase)	$12.00	8%
Power Cost	10 Hours a Day, 100 Days per year @ 4¢ power for 10 years 10 x 100 x 10 x 300 x 04 / 1000	120.00	80%
Maintenance Cost	1 new lamp per year @ $.80 $1.00 estimated annual cleaning cost (10 yrs.)	18.00	12%
		$150.00	100%

Luminaire cost is a relatively small percentage of the total cost. An inefficient luminaire which needlessly absorbs light can be very expensive. It will either deprive the student of needed light (already paid for) or will necessitate using larger lamps with a corresponding increase in power costs. Efficient luminaires are most economical.

How to Light

There are many ways to light a classroom. The suspension unit has proved to be the most economical. Suspended fixtures can be grouped into various classifications, each class having certain advantages and disadvantages.

Types of Equipment

Indirect (Necessitates good reflecting ceilings.)

Totally Indirect (Distribution—100% upward.)

Advantages	Disadvantages
Gives soft shadowless illumination.	Reversal of contrasts through units appearing as dark objects silhouetted against the white ceiling frequently objectionable. Requires frequent cleaning. Requires greater wattage.

(Reasonable Specification—at least 75% light output.)

(Reflecting surface to be of such character that its initial reflecting characteristics can be restored by washing with soap and water.)

Luminous Indirect (Distribution approximately 90% up 10% Down.)

Advantages	Disadvantages
Gives soft shadowless illumination. Minimum of contrast between background and unit. Efficiency and utilization greater than indirect.	Requires frequent cleaning.

(Reasonable Specification—at least 80% light output. Brightness within field of vision not to exceed 1.2 c.p. per sq. inch.)

(Reflecting surface to be of such character that its initial reflecting characteristics can be restored by washing with soap and water)

Semi-Indirect (Good reflecting ceilings desirable.)

Enclosing Globe Type (Distribution approximately 67% up 33% down.)

Advantages	Disadvantages
Provides excellent illumination. Gives desirable balance in flux distribution — upward component relieving contrasts. Enclosed construction simplifies maintenance. Light utilization equals luminous indirect.	Brightness slightly greater than luminous indirect.

(Reasonable Specification — at least 75% light output. Brightness within field of vision not to exceed 2.5 c.p. per square inch. Globe to be made by a process which does not permit the reflecting surface to deteriorate.)

Open Type (Distribution approximately 67% up 33% down.)

Advantages	Disadvantages
Provides excellent illumination. Efficiency and utilization very good.	Has dirt collection disadvantage of luminous indirect unit without its low brightness feature.

(Reasonable Specification—at least 80% light output—Brightness within the field of vision not to exceed 2.5 c.p. per square inch. Reflecting surface to be of such character that its initial reflecting characteristics can be restored by washing with soap and water.)

General Diffuse (Good reflecting ceilings preferable.)

Enclosing Globe (Distribution approximately 50% up 50% Down.)

Advantages	Disadvantages
Gives good illumination. Very high efficiency and utilization. Highly economical. Enclosed construction simplifies maintenance.	Brightness can be objectionable if globes are too small or are prominent within field of vision. Not practical for rooms needing more than 25 f.c. of light. Relatively large globes needed.

(Reasonable Specification—at least 82.5% light output. Globe sizes to be such that no point in the line of vision shall exceed 2.5 c.p. per square inch in brightness.)

Semi-Direct and Direct Lighting (Distribution 60%-90%-100% downward.)

These units are not recommended for classrooms.

Since maintenance is usually a serious problem in the school, the enclosed semi-indirect unit, in spite of a slightly higher brightness, seems to offer the most practical solution of the classroom lighting problem. Should maintenance not be a problem, the luminous indirect unit is preferable. Totally indirect should be avoided as maintenance is not readily checked as is the case with luminous indirect. The general diffuse white glass globe is most economical and is satisfactory for many rooms if proper attention is given to the brightness factor. It is suggested that they be mounted close to the ceiling.

Other Factors to Consider in Purchasing Lighting Equipment

Suitability —Will units be suitable in all respects—furnish desired illumination with acceptable brightness?
Efficiency —See notes on reasonable specification.
Flexibility —Can larger lamps be used if desired later?
Maintenance—Type of janitor service and ease of cleaning fixture should be given due weight.
Sturdiness —Will the fixture be as good in 10 years as when installed?
Appearance —Both lighted and unlighted.

How to Purchase Lighting Fixtures

Lighting fixtures and glassware can be secured by specifying a manufacturer's product by name and number and permitting the contractor to bid on equivalent substitutes, or by specifying the equipment on a performance basis. This second method seems preferable, as it opens the bidding to manufacturers of quality equipment on an equal basis.

The school authorities and architect should first decide on the type of equipment desired. After this decision has been made, it is relatively easy to draw up a specification based on minimum efficiency and maximum brightness, also covering general quality, mechanical durability and other factors. The Illuminating Engineering Society standard testing procedure, which measures the product of all manufacturers on an equal basis, serves as an excellent foundation for a performance specification.

Suggested Lighting Glassware Specification

Glass Quality

The glass shall be of the best quality, unilayer, homogeneous character, free from streaks, cords, stones, blisters or other defects which would detract from the appearance or performance of the unit; shall be mechanically strong and shall be well annealed. All globes shall be totally enclosed except for the fitter opening. The edge of the fitter opening of the globes and the edges of luminous indirect bowls shall have a smooth reinforcing finish. The glass or reflecting medii shall be of such character that when cleaned with soap and water and a mild abrasive the original photometric characteristics shall be restored.

Photometric Characteristics

When tested in accordance with the standard testing procedure of the Illuminating Engineering Society, the glassware shall conform to the following:

Luminous indirect bowls shall have an overall output of not less than 80% with not more than 10% of the light of the bare lamp in the lower hemisphere. Brightness within normal lines of vision shall not exceed 1.2 candlepower per square inch.

Semi-Indirect enclosing globes shall have an overall output of not less than 75% with not more than 25% of the light output of the bare lamp in the lower hemisphere. Brightness within normal lines of vision shall not exceed 2.5 candlepower per square inch.

General diffuse lighting globes shall have an overall output of not less than 82.5%. Globe size shall be such that brightness within normal lines of vision shall not exceed 2.5 candlepower per square inch.

CORNING *means* Research in Glass

SCHOOL LIGHTING LUMINAIRES

Corning Glass Works manufactures and sells glassware only but complete fixtures of the type illustrated below in full range of sizes and using Corning glassware are procurable through local dealers and jobbers.

LUMINOUS INDIRECT LIGHTING

"THE MAGNALUX"
Denax Glass

Proprietary Mould

Available through Westinghouse Electric & Manufacturing Company and their distributors.

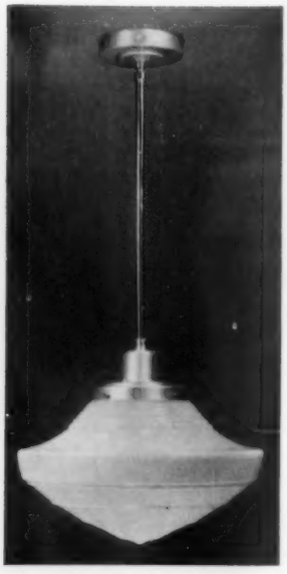
"THE CAPITAL"
Denax Glass

Proprietary Mould

Available through Art Metal Company and their distributors.

SEMI-INDIRECT LIGHTING ENCLOSING GLOBE

"THE ASTRON"
Galax Brand Glass



Photometric Performance based on I.E.S. Testing Procedure

Overall Output...76.5%.

Maximum brightness of lower portion of globe, 2.3 candlepower per square inch.

Test made using 300 watt lamp in 16" dia. globe.

"THE HALLSTADT"
Galax Brand Glass

Photometric Performance based on I.E.S. Testing Procedure

Overall Output...81%.

Maximum brightness of lower portion of globe 2.1 candlepower per square inch.

Test made using 300 watt lamp in 16" dia. globe.

GENERAL DIFFUSE LIGHTING

ENCLOSING GLOBE

"THE ORION"
Monax Glass

Photometric Performance based on I.E.S. Test Procedure:

Overall Output...85%.

Maximum Brightness, in line of vision, 2.5 candlepower per square inch.

Test made using 200 watt lamp in 16″ dia. globe.

"THE PILGRIM"
Monax Glass

Photometric Performance based on I.E.S. Test Procedure:

Overall Output...83%.

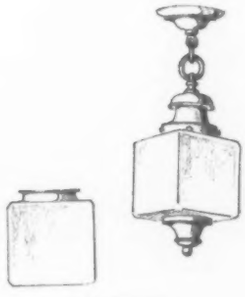
Maximum Brightness, in line of vision, 2.2 candlepower per square inch.

Test made using 200 watt lamp in 16″ dia. globe.

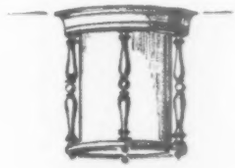
FOR VESTIBULES, CORRIDORS, WASHROOMS

MONAX CUBES

Exit



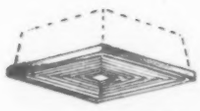
Lantern



A Close-up Cylinder Lantern for Low Ceilings

Lanterns of All Sizes and Styles Can Be Made with Glass Cylinders

Round Ball Globes



Flush Ceiling Plate Unit for Gymnasiums, Etc.

Half Shade

CORNING *means* RESEARCH IN GLASS

THE AMERICAN SCHOOL AND UNIVERSITY

CHASE BRASS & COPPER CO.

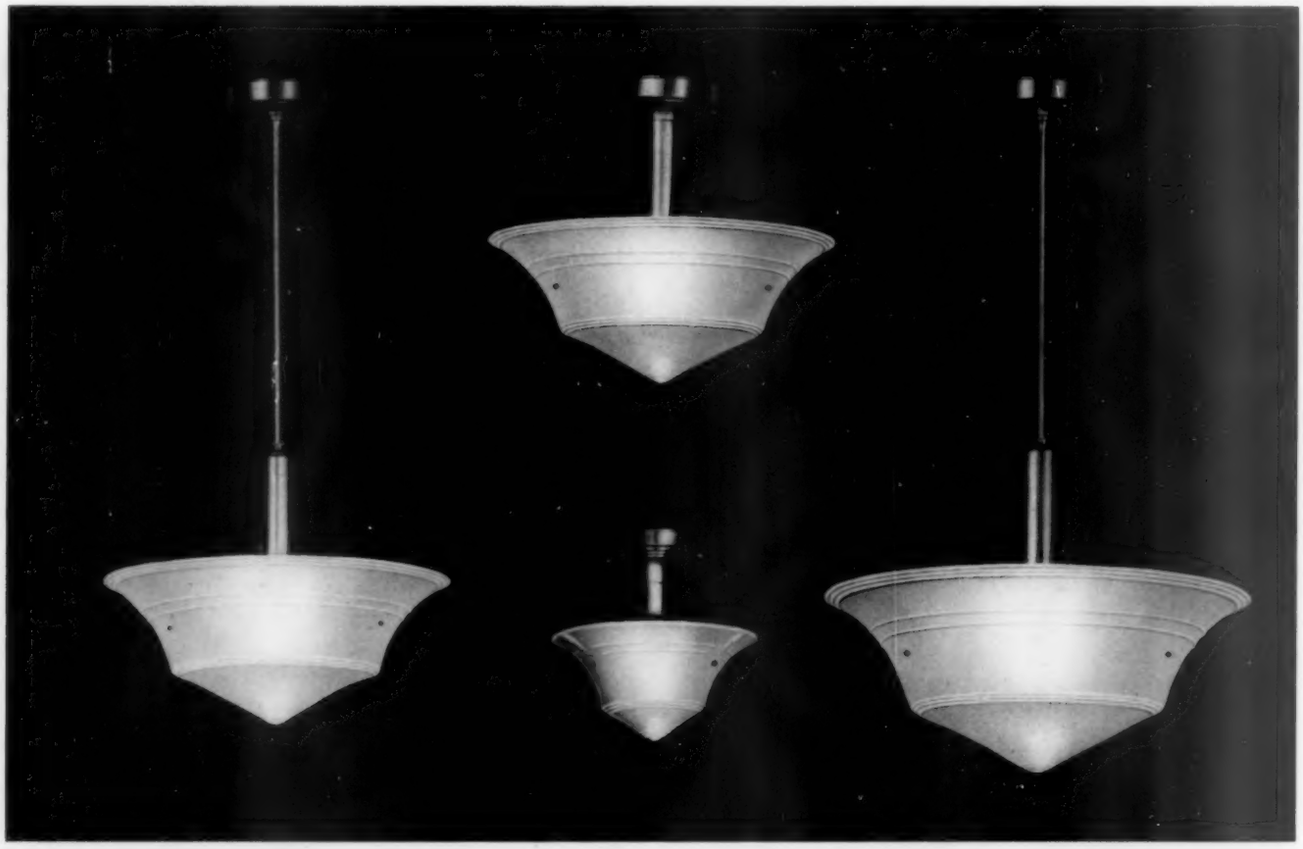
INCORPORATED

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Lighting Fixture Division 5 Thomas St., Waterbury, Conn.

CHASE

Chase Midas Semi-Indirect Fixtures



SCIENTIFIC—EFFICIENT—GLARELESS

Chase Semi-indirect Fixtures such as the No. 1549 (illustrated above, right) registered 87% light output by Electrical Testing Laboratories, New York.

The luminous bowl blends into the reflected light from the ceiling, and at the same time eliminates dark areas beneath the fixture. The color of the light is a soft, mellow, honey color—easy on the eyes. The bowl is made of a plastic material, weighing 75% less than glass, non shatterable, and not easily broken —safe for children to work under. These fixtures are made for lamps from 40 watts to 1000 watts. They are made of brass, properly chromium plated to last indefinitely. There are many details of these fixtures, developed by Chase engineers, which will interest you.

We will be glad to tell you of many installations which have been made. Write for your circular giving complete information regarding the Chase Midas school room fixtures.

These fixtures bear the Underwriters' label of approval.

CHASE BRASS & COPPER CO.

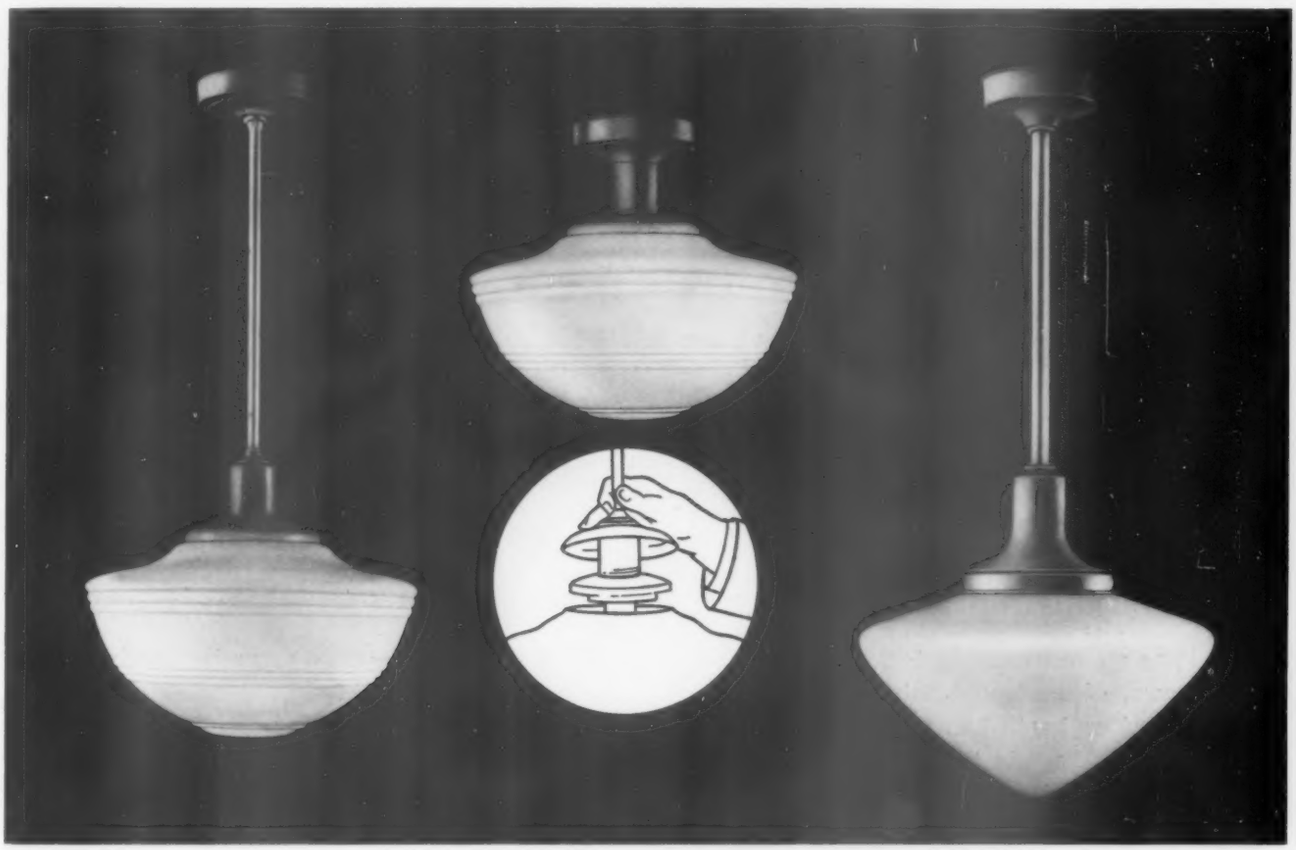
INCORPORATED

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Lighting Fixture Division 5 Thomas St., Waterbury, Conn.

CHASE

Chase Safety Type Enclosing Globe Fixtures



SIMPLE — DEPENDABLE — SAFE

These Chase fixtures are constructed so that the glass is held from the inside. The glass is locked tightly without movable parts. The construction of the fixture permits the removal of the globe for cleaning and relamping, without difficulty. These fixtures are made of 22-gauge brass, and are properly chromium plated.

They are constructed with a Chase concealed, patented swivel for self-aligning. The glass is made to exacting requirements for efficiency. These fixtures all bear the Underwriters' label of approval.

NEW CATALOG!

Write for the Chase Commercial Lighting Fixture Catalog No. 13. Illustrations and specifications of Chase fixtures for school lighting are included.

Write to

CHASE BRASS & COPPER CO., Incorporated, 5 Thomas St., Waterbury, Conn.

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES IN PRINCIPAL CITIES

GENERAL ELECTRIC AUTOMATIC LIGHT CONTROL

Assures Correct Schoolroom Lighting at All Times

An Automatic Thermostat Controls Your Heat — NOW You Can Have G-E Automatic Control for Your Light

In devising an inexpensive photoelectric lighting control unit for classrooms and study halls, the General Electric engineers have succeeded in solving a very vital school problem — the problem of minimizing eyestrain due to faulty lighting.

The application of the Photoelectric Relay to schoolroom light control is simple. A phototube, or "electric eye," is set up so that natural light from the windows falls on the tube. Variation in the amount of light striking the tube changes the current flowing in the tube. Amplified by a standard radio tube, this change operates a relay which in turn operates the lights.

Students' eyes protected by G-E automatic light control in typical school room

Adjustment of the control unit is both simple and permanent. Two knobs located on the control panel in the room fix the light level at which the unit will turn on the artificial light and the level at which the artificial light will be turned off.

Two Types

Two types of G-E Automatic Light Control are available—**flush**-mounted, and **surface**-mounted.

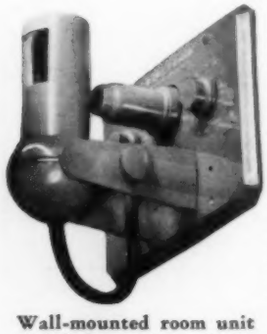
The **flush**-mounted model is best suited for installations in new buildings because it is to be installed on a three gang outlet box mounted in the wall.

The **surface**-mounted model can be used to advantage where it is not desirable to cut into the room walls.

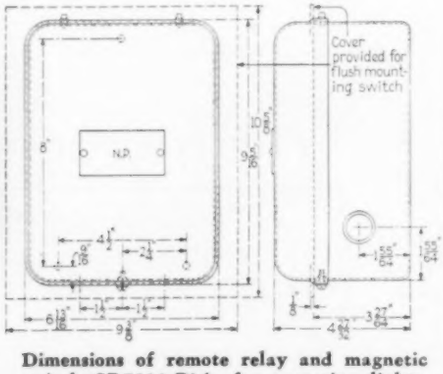
Connections to the lighting circuit of the building may be made at the regular wall switch.

Booklet

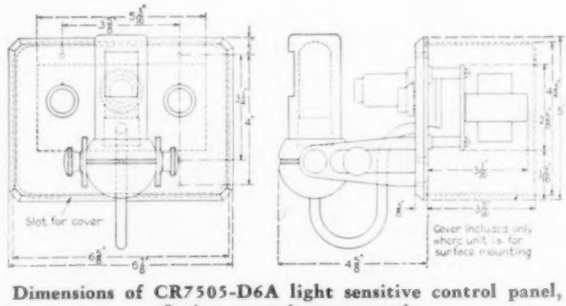
To those school executives or school architects interested in the details of G-E Automatic Light Control, we shall be glad to send a copy of our Booklet No. GEA-2606. Or a G-E representative will be glad to discuss classroom requirements with you, advising the proper type to meet your needs.



Wall-mounted room unit with light-sensitive phototube



Dimensions of remote relay and magnetic switch CR7500-P2A, for operating lights, flush, or surface-mounted



Dimensions of CR7505-D6A light sensitive control panel, flush- or surface-mounted

HOLOPHANE COMPANY, INC.

342 Madison Ave.
New York City

WORKS—Newark, Ohio

CANADIAN OFFICE: Toronto

PROGRESSIVE LIGHTING *for every school need . . .*

Modern Auditorium Lighting

Ideal Gymnasium Lighting

Special Lighting for Service Areas

In-Bilt Classroom Lighting

Holophane Planned Lighting keeps pace with educational progress by conserving eyesight and promoting better work.

●

Proper lighting minimizes visual effort, increases student incentive, improves educational standards.

●

Every Holophane specific is designed to produce the greatest amount of useful light from a given investment in current and lamps.

●

For work or play—there is a Holophane lighting specific for every area in your school. Write for complete data.

A highly specialized engineering department is maintained for the purpose of giving free planning and specification service on lighting . . . Just state your problem, and leave the rest to Holophane.

HOLOPHANE
PLANNED LIGHTING
PRODUCES THE GREATEST
AMOUNT OF USEFUL LIGHT

GLEASON-TIEBOUT GLASS CO.

MAIN OFFICE
99 Commercial St., Brooklyn

Manufacturers of

CELESTIALITE
[PATENTED]
NEXT TO DAYLIGHT

Celestialite, The Three Layer—"Next-to-Daylight" Lighting Glass, has been truly named the "Magic Glass," for while it is a well known fact that color corrective glass such as Celestialite must absorb more of the total lamp lumens than single layer glass, it develops comparable intensity.

Visual Acuity—is considerably increased by the use of Celestialite—(actual test figures 20%).

Visibility—equal amount of the printed page is obtained with only 80 percent as much transmitted light with Celestialite as with single layer Opal glass.

Eye Comfort—is assured with the use of Celestialite—an important factor in School lighting.

Diffusion—perfect diffusion is assured by the soft "Next-to-Daylight" flood of light.

SOME SCHOOLS AND UNIVERSITIES NOW USING CELESTIALITE

Amherst	Virginia
Wesleyan	University of Texas
Columbia	City of Boston
Princeton	City of Rochester
Hunter	Reading, Pa.
Wells College	City of New York
Cornell	City of Reading, Pa.

One of several new shapes exclusively made in Celestialite. Write for Catalog showing other shapes and complete fixtures for easy specifying, free fragment.

No. 12170

Celestialite Division, 200 Fifth Avenue, New York City

No. 12180

L. S. B.
(Patented)
A NEW GLASS

Pupils in many schools and colleges are now enjoying the benefit of a new development in lighting glassware—the L. S. B. glass. L. S. B., meaning Low Surface Brightness, was developed to provide easy comfortable seeing with globe brightness well below the maximum established by the American Institute of Architects and the Illuminating Engineering Society. It accomplishes this with remarkable efficiency as reports from Electrical Testing Laboratories attest.

L. S. B. glass is blown in globe form. The upper portion of the globe is almost clear glass with just enough fogged translucence to afford a measure of diffusion. The lower portion is a beautiful, dense, velvety white. The globe is made in one piece thruout, the dense white bottom being obtained by patented process.* No paint or enamel is used, the globe is all glass. The highly reflecting inner surface directs over 83% of the light upward, providing dust proof indirect lighting in globe form.

The soft luminous lower portion of the globe keys the light levels of room and ceiling. The blending of succeeding gradations of intensities of room, light source and ceiling are most restful to the eye. Globe reflections on polished surfaces are of such low intensity as to cause no discomfort. Safeguard your school children against eye fatigue. Use L. S. B. glass in your school lighting equipment.

Write for a folder containing engineering data and further description. A fragment of L. S. B. glass cut from the globe will be sent on request.

* L. S. B. glass mfr. licensed under U. S. Pat. 1778305.

THE F. W. WAKEFIELD BRASS COMPANY

1939 Yearwood Park, Vermilion, Ohio

Over 30 Years in the Manufacture of Lighting Equipment

DISTRIBUTORS IN 104 CITIES

BETTER LIGHT
for schoolrooms
old and new . . .

The COMMODORE

- Molded from Plaskon
- Glareless, indirect light
- Low maintenance cost

THE COMMODORE is scientifically designed to provide the right kind of light to protect and help the eyes of both pupil and teacher. And its precision-molded shade of Plaskon, that weighs ounces instead of pounds, brings to users of this lighting unit these advantages: 1. unusually efficient, indirect light; 2. easy cleaning; 3. increased safety; 4. less breakage; 5. low maintenance costs; 6. uniform color, that stays constant, with proper fixture use.

A BEFORE-AND-AFTER STORY IN ONE PICTURE

See what a difference in light . . . with the Commodore

This unretouched night photograph, taken outdoors to show indoor lighting, tells at a glance how the Commodore improves seeing conditions in schoolrooms. The upper room of this Ashland, Ohio, school was lighted with the old units; the lower, with Commodores.

GIVES MORE LIGHT . . . AND BETTER LIGHT

The Commodore provides 86% of the light from the bare bulb, according to Electrical Testing Laboratories, famous New York research and testing organization . . . **more** light than most indirect fixtures. And this light is restful to eyes; because it is diffused and because the shade is low in brightness. For best results, light ceilings are necessary.

Classroom, School of Education Building, Leland-Stanford
186 Commodores help light this building

MODERNIZES SCHOOLROOMS OVER NIGHT

Many a classroom, which used to seem old-fashioned, now seems like new . . . thanks to modern seeing conditions, brought by Commodores. Better light, plus the Commodore's simple modern design, attractive white Plaskon shade and brushed aluminum shaft make a big difference in the appearance of a room and a big difference to the people in it. "Attitude, attentiveness and classroom work of pupils definitely improved," was the comment made on this room below.

Superior School, East Cleveland, O., modernized with Commodores

ASK FOR THIS HELPFUL BOOKLET

We shall be glad to send you, free, an interesting 16-page booklet, entitled, "Lighting Recommendations for Schools." Presents many important facts . . . points out the danger in depending too much on window lighting . . . gives case histories on results secured before and after better lighting . . . offers definite suggestions for securing good light.

WESTINGHOUSE ELECTRIC & MFG. CO.

Edgewater Park **LIGHTING DIVISION** Cleveland, Ohio

Complete Interior Lighting Equipment

Magnalux

TI Luminaire

Silvurn

Lunaire

MB Luminaire

GB Luminaire

Magnalux sets a new standard of modern indirect illumination in schools. Magnalux combines glareless lighting efficiency with beauty of design.

TI Luminaire is a totally indirect aluminum lighting unit of modern design, construction and performance. TI is styled to blend with all architectural interiors.

Silvurn is notable for its even diffusion of adequate light intensities. Silvurn provides efficient, economical semi-indirect illumination for classrooms.

Lunaire is a semi-indirect enclosing globe type of lighting unit particularly well adapted to the needs of school and university classrooms.

MB Luminaire is a new totally indirect luminaire specifically designed for Bipost Lamps. Provides abundant shadowless light for eye-conservation of school pupils.

GB Luminaire, specifically designed for Bipost Lamps, has a patented Denax glass basin that affords well-diffused lighting for classrooms, study halls, libraries, etc.

WESTON ELECTRICAL INSTRUMENT CORP.

601 Frelinghuysen Avenue, Newark, N. J.

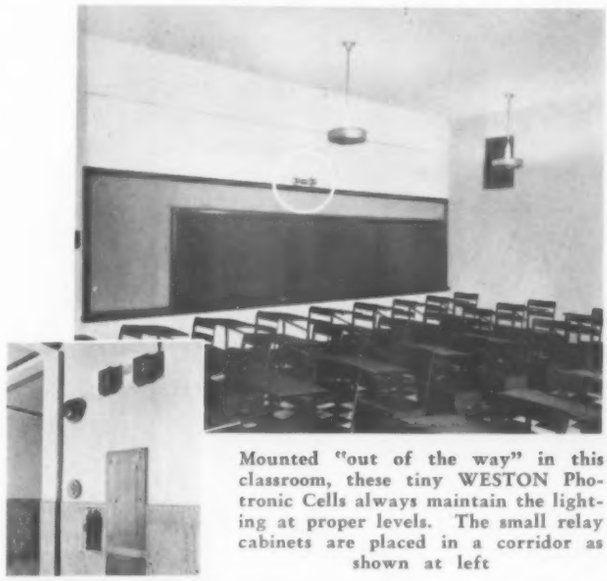
ENGINEERING AND SALES OFFICES

Albany	Cleveland	Jacksonville	Minneapolis	Pittsburgh
Atlanta	Dallas	Kansas City	Newark, N. J.	Rochester
Boston	Denver	Knoxville	New Orleans	St. Louis
Buffalo	Detroit	Los Angeles	New York	San Francisco
Chicago	Honolulu, T. H.	Meriden, Conn.	Philadelphia	Seattle
Cincinnati				Syracuse

AUTOMATIC ILLUMINATION CONTROL ends eye fatigue ... banishes the cause of most classroom failures

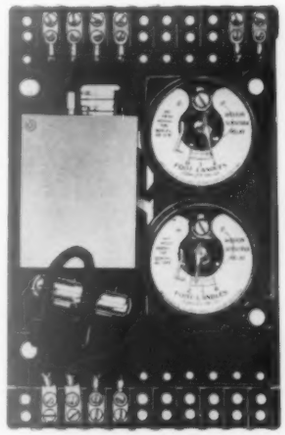
Schools everywhere are adopting WESTON Illumination Control because of its simplicity and proved dependability.

Simple, inexpensive, and easy to install in new or old buildings, WESTON *Photronic Illumination Control exactly meet school requirements for a device which will automatically maintain classroom lighting at proper levels, and thus banish the eye-strain and tension which result from eye-fatigue.



Mounted "out of the way" in this classroom, these tiny WESTON Photronic Cells always maintain the lighting at proper levels. The small relay cabinets are placed in a corridor as shown at left

A typical WESTON installation, one of many throughout the country, is shown above. Note that only the small Photronic (dry type photo-electric) cell need be mounted in the classroom. The cell is wired to the compact relay panel which can be placed "out of the way" . . . in a closet, corridor, or even in the basement. That's all there is to a WESTON Photronic installation; for no amplification is necessary; no other auxiliary equipment used. The operation, too, is simple. The relays on the control panel are quickly adjusted to turn the lights "on" and "off" at predetermined lighting levels. From then on, operation is entirely automatic; there is nothing to change or adjust during years of dependable operation.



Close-up of WESTON Photronic Relay cabinet, showing "on" and "off" relays

In addition to this proved and preferred method of automatic lighting control, WESTON also supplies the WESTON direct-reading Foot-Candle Meter shown below. Placed on a desk, or held in any classroom location, it instantly shows the amount of light (daylight or artificial) available at that location. Thus by quick, periodic check, it can be ascertained whether or not each pupil has the proper amount of light for proper seeing.

WESTON'S long and broad experience in automatic illumination control in schools throughout America is at your service to help you apply it to local needs and conditions. Call on the WESTON representative in your vicinity, or write direct to Newark for further details. Weston Electrical Instrument Corporation, 601 Frelinghuysen Avenue, Newark, New Jersey.

WESTON Model 703 direct-reading Foot-Candle Meter

* Photronic—A registered trademark designating the photoelectric cells and photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corporation.

INTERNATIONAL BUSINESS MACHINES CORP.

INTERNATIONAL TIME RECORDING DIVISION

Manufacturers of Electric Time, Signal Program, Telephone, Fire Alarm and Central Control Sound Systems

WORLD HEADQUARTERS BUILDING

590 Madison Avenue, New York, N. Y.

CANADIAN DIVISION: 300 Campbell Avenue, TORONTO, ONTARIO

BRANCH OFFICES AND SERVICE STATIONS IN THE FOLLOWING CITIES

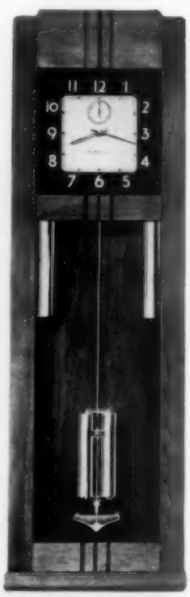
Akron, Ohio
Albany, N. Y.
Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbia, S. C.
Columbus, Ohio
Dallas, Tex.
Dayton, Ohio
Denver, Colo.
Des Moines, Iowa
Detroit, Mich.
El Paso, Tex.
Endicott, N. Y.
Erie, Pa.
Evansville, Ind.
Flint, Mich.
Grand Rapids, Mich.
Harrisburg, Pa.
Hartford, Conn.
Houston, Tex.
Huntington, W. Va.
Indianapolis, Ind.
Jackson, Miss.
Jacksonville, Fla.
Jersey City, N. J.
Kansas City, Mo.
Los Angeles, Calif.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Newark, N. J.
New Orleans, La.
New York, N. Y.
Oakland, Calif.
Oklahoma City, Okla.
Omaha, Neb.
Oshkosh, Wis.
Peoria, Ill.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Me.
Portland, Ore.
Providence, R. I.
Reading, Pa.
Richmond, Va.
Roanoke, Va.
Rochester, N. Y.
Rockford, Ill.
St. Louis, Mo.
Salt Lake City, Utah
San Antonio, Tex.
San Francisco, Calif.
Scranton, Pa.
Seattle, Wash.
Shreveport, La.
South Bend, Ind.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Tulsa, Okla.
Washington, D. C.
Wheeling, W. Va.
Wichita, Kan.
Winston-Salem, N. C.
Youngstown, Ohio

ELECTRIC TIME AND PROGRAM EQUIPMENT

Metal Case Secondary Clock

Marble Dial Secondary Clock

International manufactures hundreds of different types of time recording, indicating and signaling devices. Most of these are furnished for operation individually or as secondary units in a master clock controlled system. In the latter case, any building or group of buildings is furnished with completely automatic and dependable electric time service. Attendance time recorders, job time recorders, wall clocks and time stamps operate in exact unison.



International Master Clock with Mercurial Pendulum

This Clock System, of the electric impulse type, features automatic, electric regulation. Once each hours all units are simultaneously supervised. That is, they are checked or aligned for continuous agreement with their master time source. Practically all maintenance is thus eliminated. This system ordinarily operates from the commercial lighting circuit, but battery operation is furnished when necessary.

A Typical Tower Clock Built to Meet the Architect's Special Requirements

Program equipment, operated as part of the International Self-regulating Electric Time Systems, makes it impossible for clocks or bells to contradict each other. Through its use, classes are moved, work periods are designated or phases of process work are marked by audible signals—exactly as scheduled.

All International equipment is furnished according to architects' specifications — designs, styles, etc., to meet individual requirements, architectural or decorative schemes. Consult representatives for full details.

The International Metal Disc Program Signaling Unit

FIRE ALARM EQUIPMENT

International Fire Alarm Systems offer the most up-to-date equipment for the protection of property and life. Only the latest engineering features and approved circuits are included in each installation. Expert workmanship and rugged construction assure highest quality at minimum cost. Systems for any requirement built to specification.

Fire Alarm Gong

Fire Alarm Control Panel

All International equipment, including Fire Alarm Systems, has been approved by the National Board of Fire Underwriters.

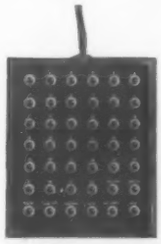
Break Glass Station

Data sheets are available in all International offices covering the complete range of equipment from the simplest non-code to the most elaborately supervised and coded systems. To meet every individual need, a wide variety of bells, horns, sirens and other alarm sounding devices has been provided.

INTER-ROOM TELEPHONE SYSTEMS

International Telephone Systems are specially designed only for interior communication in schools, business organizations, apartment houses, residences, etc. Several types are available to meet specified requirements.

Cradle Type & Telephone



Telephone Push-Button Mat

All equipment is specially designed for the greatest convenience, ruggedly constructed to furnish the highest quality service at minimum cost. Operation of all types is extremely simple. Either direct or alternating current may be employed as desired. Many types of telephone instruments in both pedestal and wall models are available.

Flush Wall Telephone

CENTRAL CONTROL RADIO, MUSIC AND SPEECH SYSTEMS

Surface Wall Type Sound Reproducer

For those places where sound must be amplified to reach large audiences and for institutions where it is desirable to distribute sound programs simultaneously throughout a number of different rooms in any one or more buildings, International provides an unusual Central Control Radio, Music and Speech System. It permits the flexible use of radio, phonograph or microphone programs through one instrument that is as simple to operate as the ordinary home type radio.

Single-Channel Sound Control Cabinet

A unit plan of construction is employed to permit purchase in sections. As the demand grows or as funds become available, extra sections may be added. Such additions do not make the original equipment obsolete, nor take up extra floor space.

The loudspeakers, which assure faithful, life-like reproduction, are provided in a wide range of models including both permanent field and dynamic types to meet every possible acoustic or decorative requirement. Directional horn speakers are provided for athletic fields and other outdoor uses.

Sound Reproducer and Clock Combined in One Unit

SPECIFICATION-WRITING SERVICE

In every International office there is some one qualified to give expert help in the writing of specifications for the various types of low tension equipment listed on these two pages. An International representative will also be able to give valuable assistance in selecting the kind of equipment most suitable for each job. This service is yours, merely for the asking.

The International line includes almost every kind of time and sound distribution equipment. In addition to the systems listed here there are many specialties and accessory devices, such as paging systems, watchman's clocks, recording doorlocks, chimes, etc.

Complete information is available at any of the offices of **International Business Machines Corporation** listed on the preceding page.

LANDIS PROGRAM CLOCKS

BUILT, SOLD AND GUARANTEED BY

THE CINCINNATI TIME RECORDER COMPANY

Cincinnati, Ohio

LANDIS TIME KEEPING AND SIGNALLING EQUIPMENT FOR SCHOOLS AND COLLEGES

The LANDIS line includes every electro-mechanical device for synchronized multiple-station showing of time and signalling of schedule periods. Any size system, from a simple two or three station installation for the small school to the most elaborate, many-station kind required for the numerous buildings on a far-flung university campus, can be selected entirely from CTR-built LANDIS time and program instruments, and guaranteed accessories; all procurable from this single source.

In addition to Master Clocks, Program Machines, and Secondary Clocks (with or without bells or other signalling devices) for marking class and lecture periods, the LANDIS line includes other electrical equipment particularly useful in science instruction in schools: Laboratory Voltage Distribution Control Panels, Instructors' Panels, Student Table Outlets, etc. Athletic Timers and accurate timekeeping scoreboard Clocks for gymnasiums and playing fields are also available.

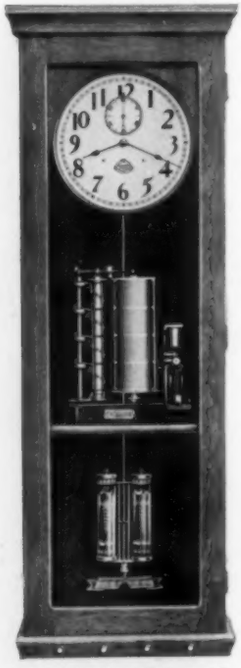
LABOR TIMEKEEPING EQUIPMENT

The Cincinnati Time Recorder Company, makers and distributors of the LANDIS line, have since 1896 been famous as builders of finest precision Time Clocks, Employees' Attendance and Payroll Recorders, Job Time Recorders and Time Stamps. Any CTR electric time **recording** machine can be hooked up in circuit and synchronized in a LANDIS time signalling system. Often it is desirable to record employes' time on duty in relation to the school schedule and activities. A Time Stamp can be very useful in automatically printing on papers and documents the exact time of receipt or forwarding.

OPERATING PRINCIPLE OF LANDIS SYSTEM

Electrical impulses, one each minute, sent out over the wires from the master clock cause the time progression machinery—and, of course, the hands on the clock dial—of every secondary instrument hooked up in the circuit, to advance with the master instrument. A synchronization control device automatically switches on once each hour to reset any or all secondary instruments which, through failure of the electric current or other causes, may not be in time with the master clock.

This system is by far the most rugged, simple and economical. It results in uniform time and signals, making possible coordinated action and efficiency.

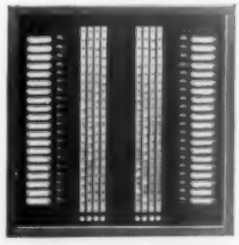


Combined Master and Program Clock 1-Minute Type Program Machine

PARTIAL LIST OF LANDIS AND CTR EQUIPMENT

- Master Clocks
- Secondary Clocks
- Program Machines
- Push Button Boards
- Laboratory Control Panels
- Athletic Timers
- Program Bells, Buzzers, Horns
- Fire Alarm and Telephone Call Bell Systems
- Time Recorders (Employes')
- Time Stamps

Complete information on any one or more of the above products or systems will be sent on request. Consult us without obligation regarding your timekeeping, time signalling and time recording problems



Push Button and Cross-Connecting Board

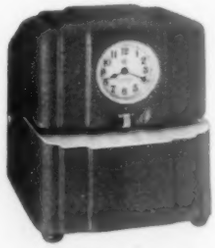
THE CINCINNATI TIME RECORDER COMPANY

1733-43 CENTRAL AVENUE CINCINNATI, OHIO

SALES AND SERVICE REPRESENTATIVES IN PRINCIPAL CITIES

Style 2M Round Metal Secondary Clock

Style 3S Square Wood Secondary Clock



"TYManDATER," an All-Purpose Time Stamp

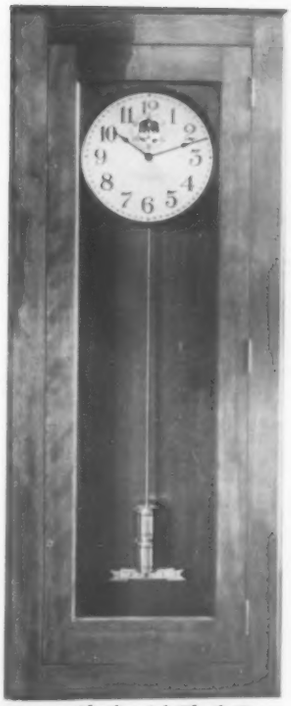
THE STANDARD ELECTRIC TIME COMPANY

Springfield, Mass.

BRANCH OFFICES IN PRINCIPAL CITIES

Manufacturers of

"Standard" Electric Time, Telephone and Fire Alarm Equipment
Laboratory Current and Sound Distribution Systems



Master Clock with Flush Case

PROGRAM CLOCKS

For Schools, Industrial Plants, Public and Private Buildings.

"Standard" Electric Time equipment is precision made throughout, absolutely reliable and capable of rendering long service. Standard Master Clocks can be easily and quickly adjusted to meet any program changes that may be required. Program clocks are furnished in either tape or metal disc types. All master clocks are self-winding and built to control as many secondary clocks as are required for any building. Standard automatic hourly correction control assures accurate time in every room, thereby avoiding confusion and delay.

Secondary clocks are obtainable in a wide variety of designs to harmonize with any decorative scheme.

Wall phone with watch case receiver

TELEPHONE SYSTEMS

Consist of combination bell control board and central telephone station. Raising of receiver signals office. All conversations may be supervised if desired. May be installed in combination with program bells utilizing same signals and bells.

Dynamic classroom speaker service type with inclined front

RADIO AND PUBLIC ADDRESS SYSTEMS

Complete equipment to meet modern, present day educational requirements. Principals are enabled to broadcast announcements to individual classrooms or to all classrooms simultaneously. Outside radio programs of educational interest may be relayed to any or all rooms. Microphones may be utilized for assembly speakers, etc. A classroom supervising system can also be furnished with Standard Radio Equipment.

FIRE ALARM SYSTEMS

Closed circuit panel and cabinet

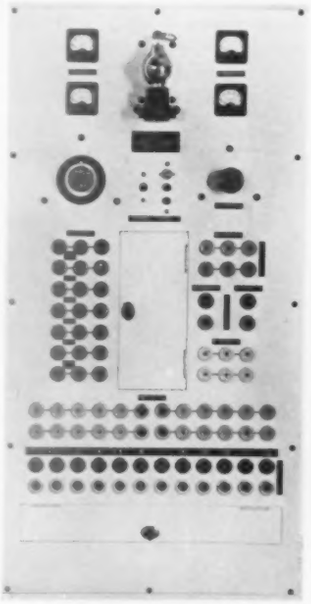
All "Standard" Fire Alarm equipment is designed and installed to meet the most exacting requirements and is approved by the National Board of Fire Underwriters. It is available in supervised closed circuit or open circuit types also with coded stations.

Tests can be made readily by opening any station with key. Various types of bell and horn signals are available. Systems may be furnished when so specified to be automatically tested each day from program clocks before the daily school session.

LABORATORY EQUIPMENT

Current Distribution for Physics, Chemistry, Biology, and Shop Departments.

Standard laboratory panels and accessory equipment are available in many designs and types to meet practically all laboratory requirements. The Standard laboratory voltage distribution systems conveniently distribute various voltages to tables and benches and are of inestimable value in every type of school laboratory. Exclusive features include jack construction, perfect contact, colored for ready selection in various voltages, sectional battery charging, and convenient table receptacles.



Typical Laboratory Panel for High School use

Wherever Standard laboratory equipment is in use there you will find a greater interest in scientific education on the part of the students.

WARREN TELECHRON COMPANY

Manufacturers of Modern Timekeeping Systems for Modern Schools

Telechron

GENERAL OFFICE AND FACTORY
Ashland, Mass.

DISTRIBUTORS AND REPRESENTATIVES IN PRINCIPAL CITIES
In Canada: Canadian General Electric Company, Ltd., Toronto, Ont.

Low Initial Cost—Negligible Operating and Maintenance Costs

Double Face Metal Case Clock for Corridor

Telechron timekeeping equipment for grade schools, high schools, colleges, administration buildings, etc., includes single face clocks for classroom and office use; double face ceiling and wall suspension clocks for corridor use; marble and skeleton types for auditorium and foyer locations; single and multiple circuit program instruments for automatic control of class schedules; signal control boards for individual classroom signal control; classroom buzzers, corridor bells, and yard gongs; outdoor clocks for face of building or tower mounting; and central control equipment of manual or automatic type to permit control of an entire timekeeping installation from one central point.

Program Instrument for Operating Classroom, Corridor and Outdoor Signals

Each Telechron clock is a complete independent timekeeper equipped with a self-starting, sealed in oil, synchronous motor, the speed of which is controlled directly by the frequency of the alternating current to which it is connected. The alternating current frequency is in turn maintained by the aid of a Telechron Master Clock located in the central station of the local power company.

Round Metal Case Clock for Classroom

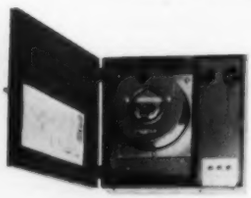
Telechron timekeeping equipment installed with central control may be of 115 volt or 24 volt type, depending on the exact requirements.

Powerful self-starting individual synchronous motor in each timekeeping device prevents scattering, and assures operation regardless of dust, dirt or vibration.

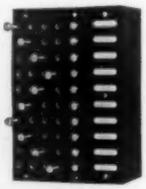
Recommendations to meet your particular requirements can be secured from your local Special Telechron distributor or by writing to the Warren Telechron Company, Ashland, Mass.—No obligation.

Your Architect has SWEET'S ARCHITECTURAL CATALOG which contains complete listings and specifications

Marble Clock for Auditorium, Foyer, etc.

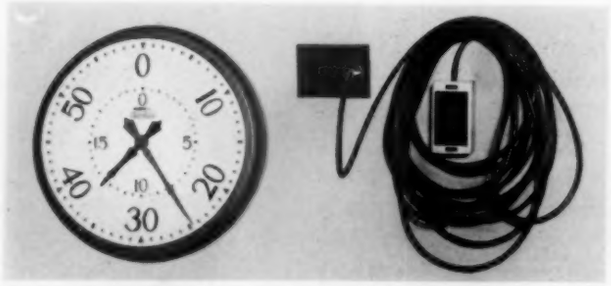


Automatic Resetting Device for Controlling ADMR (Automatic Dual Motor Resetting) Clock System



Combination Signal Control Board for Individual Classroom Signal Control

Skeleton Clock for Auditorium, Foyer, etc.



Sports Timer

No. 501820 D2 Basketball Timer with control—18" dial, 20 minute cycle with zero stop.

Sports timing equipment for football, basketball, swimming, track, etc. All sizes and types to suit every requirement.

Andrew Jackson High School, Brooklyn, New York

Andrew Jackson High School, Brooklyn, New York, is equipped with a Telechron M.D.M.R. (Manual Dual Motor Resetting) System consisting of 59 indoor clocks, program instrument, and central control equipment. Installed in April, 1937. Architects, W. C. Martin, Brooklyn, N. Y., and New York Board of Education. Engineers, New York Board of Education, Brooklyn, N. Y. Electrical Contractors, Jandous Electric Equipment Co., New York City.

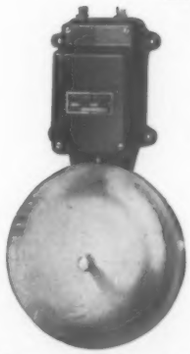
** Telechron is the trade-mark, registered in U. S. Patent Office, of Warren Telechron Company.*

THE THOMAS-SMITH COMPANY

Canton, Ohio

BRANCHES IN PRINCIPAL CITIES

Electrically and Mechanically Operated Fire Alarm Systems
Electric Bells and Signals



Liberty Vibrating Bells Are of the Plunger Hammer Type. Nos. 6-Jr. D. C. and 7-Jr. A. C. Are Made in 3″, 4″, 5″ and 6″ Sizes, and Nos. 6 D. C. and 7 A. C. in 6″, 8″, 10″, 12″ and 14″ Sizes

Nos. 86 D. C. and 87 A. C. Combination Vibrating and Mechanical Bells Are Especially Adapted for Fire Signals. They Are Made in 8″, 10″ and 12″ Sizes

Nos. 811 D. C. and 812 A. C. Combination Single Stroke and Mechanical Bells Are Also Adapted for Fire Signals. They Are Made in 6″, 8″, 10″ and 12″ Sizes

PRODUCTS

Manually Operated Fire Alarm Systems;

Electrically and Mechanically Operated Fire Alarm Systems;

Vibrating and Single Stroke Bells for Direct or Alternating Current;

Combination Electrical and Mechanical Bells;

Aluminum Grids to fit all sizes of Bells;

Steel Housings for all sizes of Bells.

THOMAS-SMITH FIRE ALARM SYSTEM FOR SCHOOLS

(Illustrated at Right)

This manual fire alarm system for schools is approved by architects and conforms with state codes. It is the only system having a rigid rod connecting the alarms on the different floors of the school buildings. Other constructive features are:

1. Supports are adjustable to take care of uneven walls or misalignment of succeeding floors.
2. The floor tube is adjustable, to allow for floors of various thicknesses, and it extends up from the floor to prevent any obstruction in operation.
3. The spring is totally enclosed and positive in action.
4. All supports and tubes are bushed with brass, lacquered.
5. Finish is enamel. Colors, red, black or buff.
6. The bells are the best made.
7. The handles are of polished brass, lacquered.
8. The operating rod is a continuous steel tube, operating gongs on all floors simultaneously.
9. Wood mats are supplied for mounting supports and gongs.

Combination electrical and mechanical bells can be furnished with above fire alarm systems for operation with electrical ringing systems.

THOMAS-SMITH LIBERTY BELLS

Thomas-Smith Liberty Bells cover all types and sizes from 4-inch to 20-inch, vibrating or single stroke, 110 volt, 220 volt, all standard transformer voltages, battery operations, direct or alternating current. All Thomas-Smith Liberty Bells embody the very finest workmanship and materials. Thomas-Smith Aluminum Grids are made to fit all sizes of bells. They fit snugly at the base of the mechanism over the shell and are bird-proof.

Write for catalog of Thomas-Smith Fire Alarm Systems and Liberty Bells.

Liberty Single Stroke Bells, Nos. 12 A. C. and 11 D. C. Made in 5″ to 14″ Sizes. Bells Contain no Springs Nor Moving Parts Except Plunger

AMERICAN DISTRICT TELEGRAPH COMPANY

A.D.T. PROTECTION SYSTEMS
155 Sixth Avenue, New York City
CENTRAL STATION OFFICES IN ALL PRINCIPAL CITIES

Automatic Fire Detecting and Reporting Systems
Manual Fire Alarm and Signaling Systems

THE AMERICAN DISTRICT TELEGRAPH COMPANY, founded in 1873, is a nation-wide organization whose sole business is the manufacture, installation, maintenance and operation of electric protection systems. The A.D.T. fire protection systems described below are operated with Central Station Service, with Direct-to-Fire Department connection, or as Local Alarm Systems.

Central Station Service: The protection system at the subscriber's premises is electrically connected to the A.D.T. Central Station, where the alarm is immediately transmitted by direct wire to the fire department, and is also acted upon by A.D.T. emergency patrol forces. This service provides continuous electrical supervision, inspections and maintenance of the system by A.D.T. Available in more than 350 cities.

Direct-to-Fire Department Service: Where Central Station Service is not available, the system may be connected by direct, private wire to the local fire department, where suitable devices are installed for receiving alarms. Arrangements may be made with A.D.T. for periodic inspections, tests and other services.

Local Alarm Systems: Include equipment for giving the alarm locally by means of audible and visual signals. Provide for owner operation and maintenance, although when necessary, arrangements may be made with A.D.T. for periodic inspection, tests and other services. Available everywhere.

Mitchell School, one of eleven public schools in Charleston, South Carolina, protected by the Aero Automatic Fire Alarm System

AERO AUTOMATIC FIRE ALARM SYSTEM

This system, as its name implies, detects fire automatically, and (when such service is provided for, as explained above) automatically summons the fire department, as well as giving audible or visual warning signals on the premises. Aero is a combined pneumatic and electrical system which operates on the rate of temperature rise. The pneumatic part of the system consists of inconspicuous copper tubing, 1/12 in. diameter, run in loops or circuits along the ceiling or under the roof. Both ends of each tube circuit terminate in small metal chambers formed by expansible metal diaphragms of the aneroid barometer type. The rapid rise in temperature caused by a fire condition results in increased pressure within the tubing, which bulges the diaphragms, thereby making an electrical contact which results in an alarm. An annunciator shows the section of the building where the alarm originated.

Aero Detector Unit, with break-glass rod for manual operation. At right, Aero Annunciator

Fire protection engineers recognize this type of system—(operating on the **rate of temperature rise** rather than upon the attainment of any predetermined dangerously high temperature)—as assuring the fastest possible detection of fire.

While a complete Aero installation throughout a building is, of course, the ideal protection, this sometimes may not be feasible. In such cases, a partial installation covering only the areas of excessive hazard will often reduce the danger of serious fire to a point very close to the minimum.

The Aero system, by detecting the fire in its earliest stage, makes extinguishment possible with the minimum attendant damage. So speedy is the Aero system in detecting and reporting fire that a chemical hand extinguisher frequently suffices to extinguish the blaze.

Installation, Maintenance and Cost

No capital investment is required for the installation of an Aero system. The equipment is installed by A.D.T. engineers, and the service is rendered on a contract basis.

Installation of the equipment need not interfere with normal activities in the building. The inconspicuous tubing can be installed on the ceiling or walls in such a manner as not to mar the decorative scheme. The system is fully self restoring, i.e., no replacements of equipment are necessary after the system has operated.

The system can be tested whenever desired by introducing pressure into the tubing to simulate a fire condition.

Manual Fire Alarm boxes also are installed in association with the Aero System.

Write for descriptive booklet giving complete details.

SPRINKLER SUPERVISORY AND WATER-FLOW ALARM SERVICE

This service, for premises protected by automatic sprinkler systems:

(a) Makes the sprinkler system function as an automatic fire alarm, summoning the fire department automatically the instant a sprinkler head operates, or in case of a serious leak.

(b) Maintains a continuous, electrical watch over all vital parts of the sprinkler system. Any trouble condition which might impair the supply of water or its proper and effective distribution, is automatically detected and reported to the A.D.T. Central Station, which takes immediate corrective action.

Booklet describing A.D.T. Sprinkler Supervisory and Waterflow Alarm Service are available on request.

A.D.T. MANUAL FIRE ALARM AND SIGNALING SYSTEMS

Manual Fire Alarm Systems include the necessary equipment to enable the discoverer of a fire to give warnings locally and to summon assistance by manually operating a fire alarm box.

Manual Fire Alarm Systems are of two main types: coded and non-coded.

Coded Fire Alarm Systems—The coded system gives a distinctive signal on a system of bells or other signaling devices, indicating the location in the building of the box operated. When a number of buildings are to be protected, coded fire alarm systems can be furnished with **Group Control** to give an alarm at one or more points in all buildings.

Non-Coded Fire Alarm Systems—The non-coded system gives a continuous alarm on the bells or other signaling devices to warn the occupants of the building, but does not sound a code to indicate the location of the fire alarm box that has been operated.

Fire Alarm Box for Non-Coded Systems

Fire Alarm Boxes—For coded systems, boxes are furnished either with spring door or break-glass door, as illustrated. The alarm is sounded by pulling a lever inside the box. For non-coded systems, in most cases, boxes are of the break-glass door type, in which breaking a glass panel or rod results in the continuous ringing of the alarm bells. Fire alarm boxes are supplied for either flush or surface mounting.

Fire Alarm Box, Spring Door Type, for Coded Systems

Fire Alarm Box, with Break-Glass Door, for Coded Systems

Fire Alarm Bells—Single-stroke bells are used in most coded systems. The underdome type illustrated, includes a special hot pressed alloy steel gong with black rust-resisting finish. All mechanism is concealed under the bell shell. Vibrating bells are supplied for most non-coded systems. When desired, horns or other audible signals can be furnished.

Fire Alarm Bell, Vibrating Type, for Non-Coded Systems

Fire Alarm Bell, Single Stroke Type, for Coded Systems

Connection to A.D.T. Central Station and Fire Department—Where A.D.T. Central Station Service is available, A.D.T. fire alarm systems may be connected to an A.D.T. Central Station which summons the fire department directly to the location of the box operated. (For description of Central Station Service see opposite page.) Where Central Station Service is not available, connection may be made direct to the fire department.

Installation and Maintenance—The A.D.T. Manual Fire Alarm Systems described above may be purchased direct from the company or through electrical contractors. When A.D.T. Central Station Service is desired arrangements must be made with a company representative who will call upon request.

Write for descriptive booklets giving complete details.

A.D.T. WATCHMAN'S COMPULSORY TOUR SYSTEM

For schools employing watchmen. Maintains constant check on watchman's performance and investigates immediately if watchman fails to signal the A.D.T. Central Station. Summons emergency aid in case of illness, accident or attack by intruders. This system may be installed in conjunction with A.D.T. Manual Fire Alarm Service.

A.D.T. Central Stations are located in all principal cities of the United States. They operate under the name "American District Telegraph Company," with the following exceptions: CHICAGO AND ELSEWHERE IN ILLINOIS, Illinois District Telegraph Co.; CINCINNATI, OHIO, Ohio Messenger & Telegraph Co.; DETROIT, MICHIGAN, The American Still Alarm; LOUISVILLE, KY., American Protection Co.; PHILADELPHIA, PA., Philadelphia Local Telegraph Company; CITIES IN THE STATE OF NEW JERSEY, American District Telegraph & Messenger Co.

THE GAMEWELL COMPANY

Newton Upper Falls, Massachusetts

BRANCH OFFICES

New York Chicago	Atlanta Pittsburgh	Chicago Dallas	Denver Detroit	Los Angeles Montreal, Canada

FIFTY SCHOOL FIRE DISASTERS SINCE 1900
Involving Loss of More Than 400 Lives

"The public apathy is such that a holocaust involving loss of life creates only a momentary sensation of horror which is soon forgotten."

A fire alarm system, constantly and automatically supervised, which transmits the alarm instantly and directly to the fire department and at the same time provides for the orderly evacuation of the building is essential to protection of life and property.

The Gamewell Company, pioneers in the art of fire alarm telegraphy since its inception, has specialized in the development, manufacture and installation of fire alarm and other emergency signaling systems for municipalities, schools, institutions and industrial properties. Gamewell systems are now in service in all parts of the civilized world, including some two thousand municipalities and several thousand schools, institutions and commercial establishments.

In Gamewell fire alarm systems are incorporated the net results of an unequaled experience of over seventy years in this field.

Master Fire Alarm Box City Type—Surface Mounting

There are three types of fire alarm systems:

1. **The Dualarm System**—for smaller schools and institutions—directly connected with the municipal fire department where such connections are available. Local battery power not required.
2. **Proprietary Systems**—for colleges and institutions of sufficient size to warrant the installation of a complete signaling system, each including a central operating and supervising station at the protected property.
3. **Exit-Alarm Systems**—efficient, simple and inexpensive for schools, dormitories, fraternity houses, residences, etc., where connections with municipal fire departments are not available.

THE GAMEWELL DUALARM SYSTEM

The Gamewell Dualarm System simultaneously calls the fire department and sounds a local exit alarm throughout the building so that occupants may leave or be assisted therefrom in an orderly manner.

Fire drills for instructing the pupils in proper procedure in case of fire may be initiated by this system. For fire drills, the local alarms only are sounded, no alarm being sent to the fire department.

GAMEWELL PROPRIETARY FIRE ALARM SYSTEMS

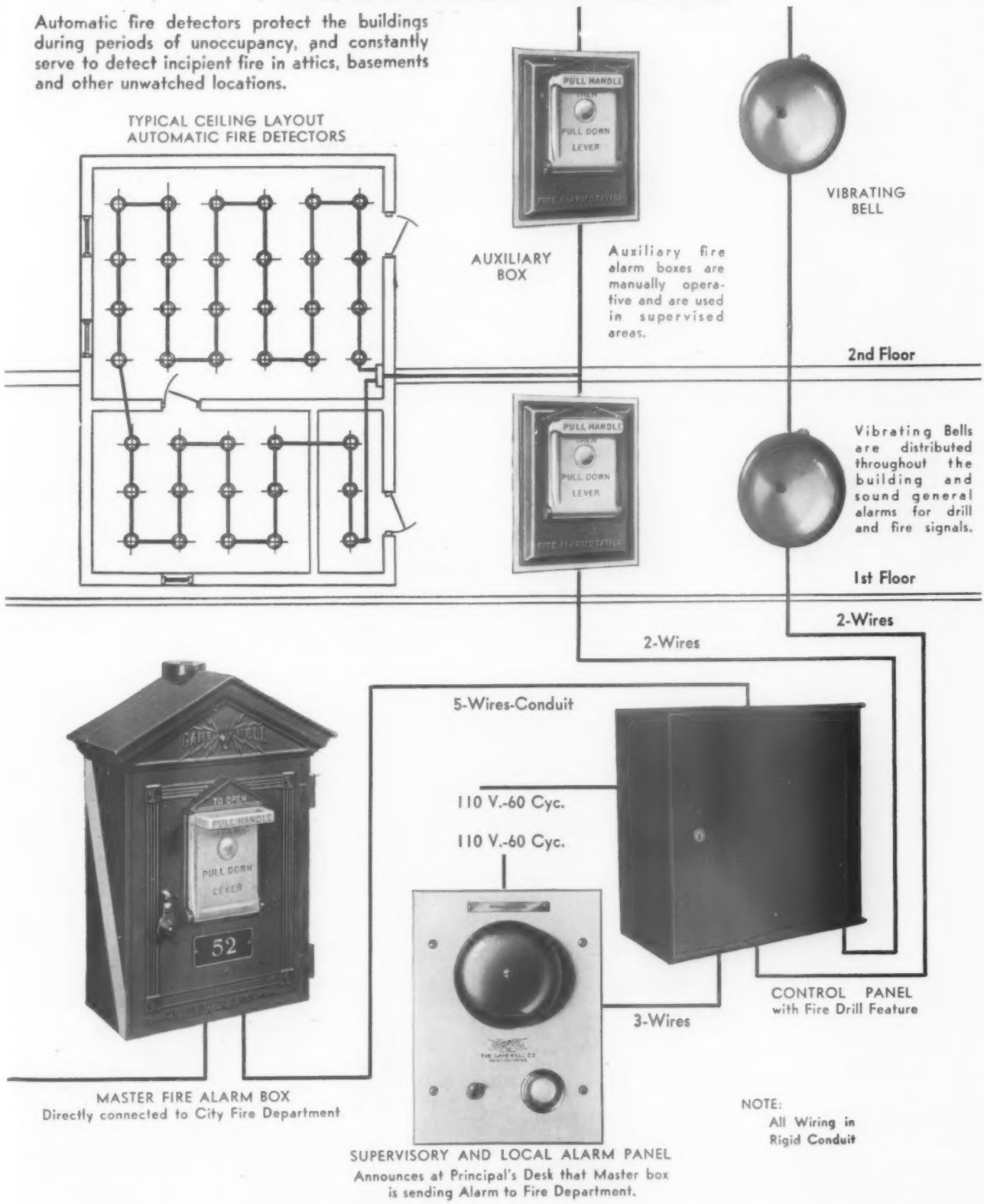
The Proprietary system includes facilities for . . . directing the local fire brigade to the scene of fire . . . calling the municipal fire department . . . automatically closing fire doors and operating water and foam deluge sets—if any—in the affected areas. . . . All as the result of the manual operation of a fire alarm box or the automatic operation of a fire detector.

Gamewell fire alarm systems are efficient, reliable, as durable as the buildings themselves, assure continuity of institutional operation and constitute a permanent investment in safety to buildings and occupants.

Write for complete descriptive catalog. Surveys and estimates freely furnished

A TYPICAL DUALARM SYSTEM

Automatic fire detectors protect the buildings during periods of unoccupancy, and constantly serve to detect incipient fire in attics, basements and other unwatched locations.



Exit Alarm Systems are identical with the above except that the Master box connection with the Fire Department is not supplied.

Spacing (1) Automatic fire detectors—generally the distance between centers should not exceed 15 feet with the first line 7½ feet from the wall. (2) Auxiliary Fire Alarm Boxes—at least one on each floor located at or near exits. (3) Vibrating Bells—sufficient in number and properly distributed to be heard distinctly in all parts of the building.

ROCKWOOD SPRINKLER CO.

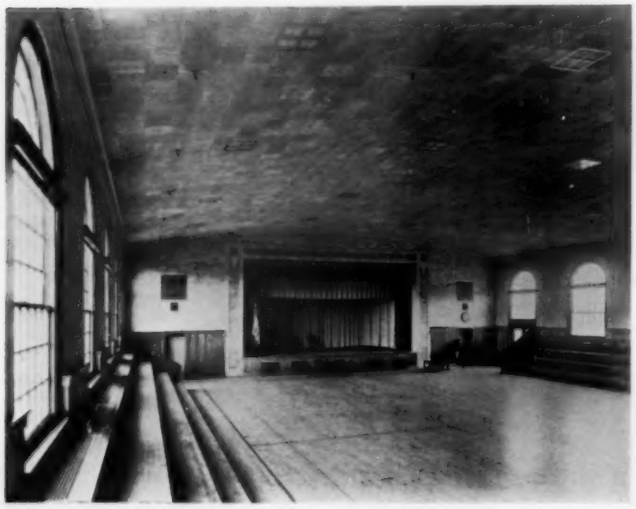
Worcester, Mass.

BRANCH OFFICES AND PLANTS

ATLANTA, GA. AUSTIN, TEX. BOSTON, MASS. BUFFALO, N. Y. CHARLOTTE, N. C. CHICAGO, ILL. CINCINNATI, OHIO DETROIT, MICH. GRAND RAPIDS, MICH. INDIANAPOLIS, IND. MEMPHIS, TENN. MILWAUKEE, WIS. MINNEAPOLIS, MINN. NEW ORLEANS, LA. NEW YORK, N. Y. PHILADELPHIA, PA. SAN FRANSCISCO, CAL. ST. LOUIS, MO. ST. PAUL, MINN.

Sole Agents for Canada: WORCESTER FIRE EXTINGUISHER CO., LTD., Montreal and Toronto

AUTOMATIC SPRINKLER SYSTEMS FOR EDUCATIONAL BUILDINGS



Inconspicuous type of sprinkler installation in auditorium-gymnasium of new Abington (Mass.) High School. Rockwood installed this sprinkler system while building was being built to replace former unsprinklered building destroyed by fire

Library of Fessenden School, West Newton, Mass., protected by Rockwood Sprinklers. Observe how ceilings have been kept entirely clear by placing sprinklers and piping behind beams. No piping whatever is visible to person entering room

Adequate fire protection for schools and colleges confronts trustees and other educational officials with a particularly serious responsibility. That is because a fire in a school is a menace to life as well as to property.

Reliable actuarial records show that 373 lives were lost in only 7 school fires in this country. As recently as last year 46 students died in a Canadian college fire. The same records disclose too that an average of five school fires occur each day. These fires roll up an annual loss exceeding $5,000,000.

The most effective and practical way to protect both students' lives and educational property is to install automatic sprinkler systems in schools and colleges. Sprinkler systems automatically discover and extinguish fires while they are still small. Over a period of 41 years, sprinklers have established a record of extinguishing or controlling over 96% of the 64,000 fires reported to insurance companies. Because of their remarkable effectiveness in cutting down fire losses, insurance companies reduce insurance rates 50% to 80% on sprinklered properties.

***Sidewall* Sprinkler Head installed in the dormitory of a prominent private school. This type of sprinkler is installed along walls or beams to keep ceiling free from piping. Furnished in attractive modern and antique finishes**

Installation of sprinkler systems in educational buildings calls for a special engineering and installation skill entirely different from that employed in putting sprinklers into the average factory or mercantile building. Rockwood has made a specialty of this class of work.

Our systems are carefully engineered first to safeguard the lives of the occupants and the permanence of the building itself against fire. Particular care is then taken to make the installation as inconspicuous as possible by concealing piping and blending sprinkler heads and fittings with the attractive interior decorative scheme. Rockwood's advanced engineering methods make it possible for us to make inconspicuous sprinkler installations even in existing buildings.

Our experienced engineers located in the nearest branch office listed above will be glad to show you photographs of the installations we have made in other educational properties and also point out just what can be done in your own particular buildings. They will also survey your buildings, let you know how much it will cost to install sprinklers and how much sprinklers will reduce your present insurance rates—without obligation. Write, wire or telephone our nearest office.

THE ELECTRIC STORAGE BATTERY COMPANY

World's Largest Manufacturers of Storage Batteries for Every Purpose

Allegheny Avenue and Nineteenth Street, Philadelphia, Pa.

(For BRANCH OFFICES see Page 507)

WHY

emergency lighting is necessary

Lighting Failures Do Happen—Storms, fires, street accidents, floods, blown fuses, short circuits—*all events which electric companies are helpless to foresee or prevent*—do cause electric lighting interruptions.

No Community or Building Immune—Electric service interruptions occur without warning, when least expected and where least wanted. An auditorium or gymnasium crowded with pupils at sports, plays, lectures or dances, is no place to gamble with the risks of fire, injury or damage which frequently attend sudden darkness.

Such Risks Unnecessary—Today, emergency lighting can be provided for the vital parts of any school building by installing Exide Keepalite. During an electric service interruption, Exide Keepalite furnishes the power from a dependable Exide Battery to the lights in auditoriums, gymnasiums, corridors, exits, fire towers, stairways, engine rooms, locker rooms, swimming pools, dormitories, laboratories, etc.

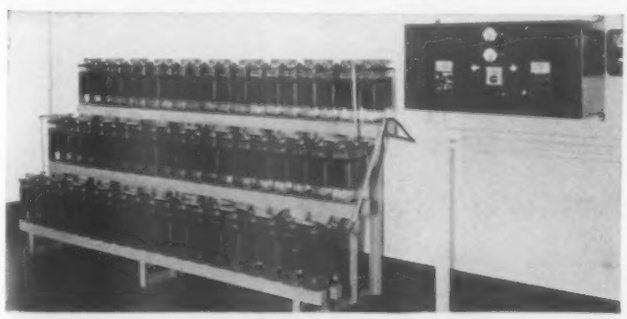
Automatic Protection—Exide Keepalite Emergency Lighting Battery Systems are completely automatic and instantaneous in operation.

A Battery System—Electrical engineers agree that a storage battery, *properly maintained*, constitutes the most dependable source of emergency power. Exide Keepalite Systems assure this form of protection at a maintenance cost as low as 1½¢ a day for power.

Exide Batteries have been used in emergency service, by telephone, railroad and public utility companies since 1895. The new Exide Keepalite control equipment, which automatically keeps the battery properly maintained, represents the qualifications found desirable from the experience of more than 2000 installations in all kinds of buildings.

For Any Size Installation—In order to economically meet the widely varying requirements of individual school buildings, 115 volt and 12 volt Exide Keepalite Systems are available. The important electrical circuits of entire buildings can be protected with the larger 115 volt systems; or, parts of buildings can be adequately safeguarded with the specially designed low voltage Exide Keepalite Systems. Depending upon the amount of protection desired, Exide Keepalite Systems can be had for $150.00 and up.

A Typical Exide Keepalite System with a 60-cell Exide Battery and a 30 Amp. Control Unit. It Operates Instantly and Automatically. The Infrequent Addition of Water to the Battery Is the Only Maintenance Required



Exide Keepalite

EMERGENCY LIGHTING BATTERY SYSTEMS

How Keepalite Works

115 Volt System—This system provides all of the control apparatus necessary to: (1) automatically transfer the emergency circuits (regular building circuits) to the battery in a split-second—whenever normal electric service fails; (2) automatically return the emergency circuits to the normal electric supply—when it has been restored; (3) automatically recharge the battery; (4) automatically keep the battery charged at all times; and (5) automatically give an alarm if anything should go wrong with any part of the Exide Keepalite equipment.

12 Volt System—This system employs its own low voltage wiring circuits to the areas within a building needing protection. Through the use of special high-efficiency lamps (which give more than twice the lumens of ordinary electric bulbs) it provides adequate emergency lighting over floor areas, totaling 10,000 square feet. This equipment consists of especially designed apparatus to: (1) automatically provide emergency lighting in a split-second after an interruption of normal service; (2) automatically go off when normal service is restored; and (3) automatically place battery on trickle charge. However, provision is made that (a) the battery can be charged at a high rate by merely flipping a switch; and (b) the working order of the equipment can be tested by pushing a button. Thus it can be seen that only the minimum amount of attention is required. Any pupil could operate an Exide Keepalite low voltage system.

All smaller buildings, or parts of larger buildings, can be protected with the new, low cost equipment. However, in larger buildings where complete lighting protection is required, naturally the larger 115-volt Exide Keepalite System should be installed. The low voltage Exide Keepalite is not a substitute for the larger systems. It was designed to afford protection for areas limited to 10,000 square feet.

This $150.00 Exide Keepalite Protects Lighting of Areas Up to 10,000 Sq. Ft. It Operates Instantly and Automatically

Superiority of Storage Battery Emergency Lighting Systems—Exide Batteries have long been used in not only emergency lighting service but also emergency power service. They safeguard the operation of railroad switches and signals, fire alarms, telephone, marine radio, industrial processes, etc.

Battery Life—More Than 10 Years—Exide Chloride Batteries used with Exide Keepalite Systems are good for 10 or more years of service.

THE ELECTRIC STORAGE BATTERY COMPANY offers the services of its trained Engineering Department to assist architects in the planning of a trouble-free Emergency Lighting System. We will be glad to send you complete descriptive literature and specifications for every type of Exide Keepalite Emergency Lighting Battery System.

Dependable Exide Laboratory Batteries available in any size, See Page 507

CORNELL IRON WORKS, INC.

ESTABLISHED
Since 1828

36th Avenue and 13th Street, Long Island City, N. Y.

BRANCH OFFICE: 378 Newbury Street, Boston, Mass. — Kenmore 1396

Telephone:
STillwell 4-3880-1-2-3

102 REPRESENTATIVES IN PRINCIPAL CITIES

PRODUCTS

ROLLING GRILLES and GATES, in steel or other metals; SLIDING GRILLES in steel or other metals; ROLLING DOORS and SHUTTERS in steel and other metals or with non-corroding curtain bottoms; Underwriters labeled rolling STEEL FIRE DOORS; complete line of UPWARD ACTING DOORS in wood or metal.

Makers of fine doors for over one hundred and ten years. CORNELL IRON WORKS, Inc., owes its origin to George Cornell, who purchased his employer's metal business July 29th, 1828, in New York City.

Labeled Rolling Steel Fire Door, coiling under lintel in the opening between the jambs. Shown in section.

Note the overhead counterbalancing shaft, used both in rolling doors and rolling grilles; and the enclosing hood. Side guides may be concealed in the wall and the overhead coil hidden in the ceiling.

ROLLING DOORS AND ROLLING GRILLES

The doors proper are made up of interlocking metal slats running in vertical metal side guides, flexible to coil. All-steel curtains are hot galvanized.

Rolling Fire Doors are labeled by Underwriters' Laboratories, Inc., for fire walls, etc.

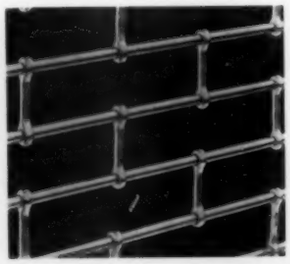
Cornell Iron Works, Inc., are the originators of the Rolling Grille in America. Cornell Rolling Grilles operate like rolling doors, but they do not block light, air or vision. They have been widely accepted for school corridors, etc. Can be completely concealed when open. Rolling Grilles are made of 5/16" round hard drawn galvanized steel bars running continuous horizontally from jamb to jamb and locked into rolled steel vertical side guides. The horizontal bars are flexibly connected by unbreakable vertical certified malleable iron or steel links; permitting entire grille to coil overhead.

Patented Locking Device: Bars throw to both sides and engage holes in backs of side guides. Padlock or cylinder lock can be furnished, workable from either side.

CORNELL *SLIDING* GRILLES

Cornell Sliding Grilles give high protection at exceptionally low cost. It is a patented steel curtain of heaviest galvanized chain link factory fence, extended to any height of opening by galvanized rods running to track above. The grilles can be used anywhere to keep out intruders and allow free circulation of air. The construction makes it possible to nest the sliding Grilles at the side of an opening in a space only 1/6 of the opening width. Grille will travel around a curve, and lie at a right angle to opening if there is 10" room available from edge of jamb.

Cornell Sliding Grilles are recommended for school corridors, as a low priced substitute for Rolling Grilles; for auditoriums and stages; for gymnasium and court windows, for entrances, gates or partitions; and for athletic and parking areas.



Close-up view of rolling grille curtain, CORNELL Standard STRAIGHT BAR TYPE

***Right*—CORNELL ROLLING GRILLE installed in corridors of Kansas High School**

SEND FOR INFORMATION

A list of schools using Cornell Doors and Grilles, and folders, will be sent upon request. Our engineering department will gladly figure your requirements.

***Right*—Close-up of Sliding Grille and two views of Sliding Grille protecting court window of school**

***At Bottom* — Three views showing Sliding Grille closed, partly open, and slid around the corner in open position**

THE KINNEAR MANUFACTURING CO.

2240–2260 Fields Avenue
Columbus, Ohio

Exclusively Manufacturers of Rolling Doors and Grilles

•

METAL ROLLING GRILLES

•

AUTOMATIC FIRE DOORS and SHUTTERS

•

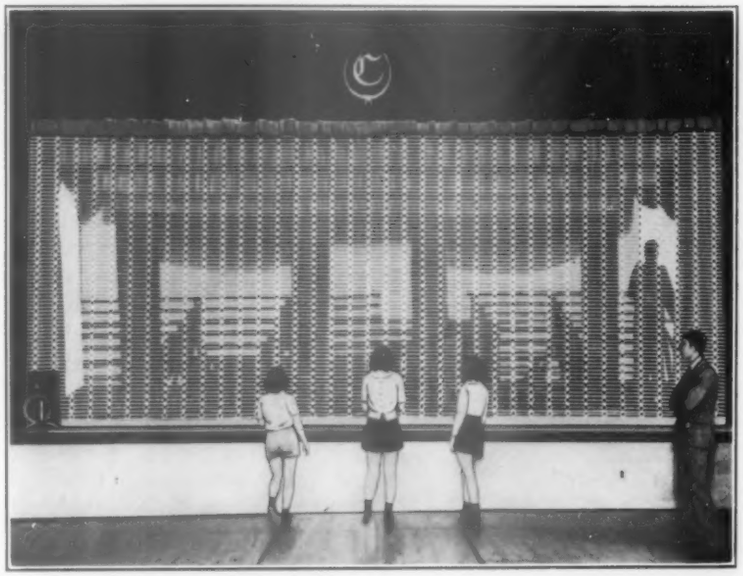
STEEL ROLLING SERVICE DOORS

•

WOOD ROLLING PARTITIONS

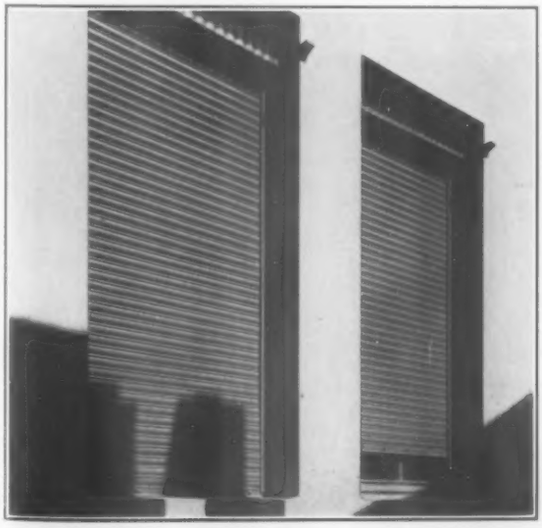
•

SECTIONAL UPWARD-ACTING DOORS



A Kinnear Rolling Grille over the stage in a combination gym and auditorium illustrates suitability of the Grille for closing off hallways, rooms or any other point where protection must be provided without sacrificing space, air, light, vision, or interior design

THE KINNEAR MANUFACTURING CO. pioneered and has devoted its entire effort for the past 43 years to rolling or **Upward-Acting** type Doors and Grilles. They have established the reputation throughout the world as specialists in doors that save floor and wall space, operate more conveniently, reduce maintenance expense through unusual durability and that can be built for old or new buildings for inside or outside use. Composed of a flexible metal curtain or grille which coils above the lintel, similar to a window shade, they can be installed either on the face of the wall or between the jambs when concealment of mechanism is desired. Springs provide perfect counterbalance. They can also be operated manually, mechanically or electrically.



Kinnear Doors come in two distinct classifications, Service and Fire. For the latter case, though suitable for service purposes, they are "labeled" and equipped with mechanism for automatic closure in case of fire. Where protection against trespassing alone is desired the Kinnear Grille is ideal—strong . . . attractive . . . out of sight when open . . . easy to operate . . . and admits air, light and vision.

With a nation-wide organization and the finest door manufacturing facilities Kinnear can handle any of your opening requirements with equipment that costs less to operate and maintain. Ask for a Kinnear recommendation.

BRANCH OFFICES

Boston	New Orleans	Detroit
New York	Pittsburgh	Chicago
Philadelphia	Cleveland	San Francisco
Washington	Cincinnati	Baltimore

AGENTS IN ALL PRINCIPAL CITIES

KINNEAR ROLLING DOORS

GENERAL BRONZE CORPORATION

34-19 Tenth Street Long Island City, N. Y.

WINDOWS · REVOLVING DOORS · ARCHITECTURAL METAL WORK · TABLETS

in Bronze, Aluminum, Stainless Steel, Nickel Silver

Double hung windows are unquestionably the most universally usable

Casement windows offer maximum variety in treatment

Tablets are fabricated in all types and sizes

"WINDOWS BY GENERAL BRONZE"—in bronze or aluminum—can be your specification for any type of installation in schools and colleges. Whether you prefer the general utility of the double hung window, the beauty and grace of the casement window or any of the specialized types of reversible, projected or pivoted windows—you can be certain that the patented, built-in, metal weatherstrip provides maximum protection against drafts, rain, dust and noise. These windows will not rust, require no paint. All-metal—no rubber or felt to wear out. Tubular construction throughout guarantees maximum strength and long life—without sticking or warping. Present costs are appreciably less than formerly for windows of less efficiency and no higher quality. "Windows by General Bronze" represent a sound investment and true economy.

General Bronze tablets are found in schools and colleges throughout the world. They offer the maximum in craftsmanship, at reasonable costs.

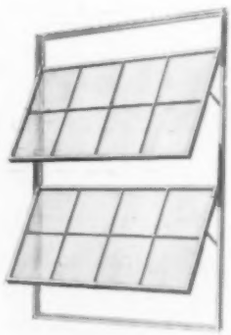
General Bronze products cover every type of architectural and ornamental metal work—in bronze, aluminum, stainless steel and nickel silver. These include such standard necessities for schools and colleges as balustrades, doors, elevator doors, entrances, gates, grilles, lamp standards, marquises, railings, signs and spandrels.

Roman Bronze Works—a subsidiary of General Bronze Corporation—executes statuary and ornamental pieces in all sizes and for all purposes—from the simplest to the heroic and monumental.

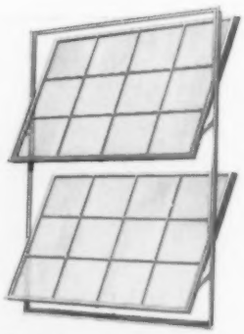
We invite you to write us for detailed specifications or illustrated folders on any division of non-ferrous metal fabrication.

Pioneer Woman
Bryant Baker, *Sculptor*

Reversible windows are easy to clean—with maximum safety



Projected windows permit maximum openings—or any degree of ventilation



Pivoted windows combine the advantages of the projected type with ease of cleaning

ACCURATE METAL WEATHER STRIP CO.

Manufacturers of ACCURATE Metal Weather Strips and Extruded Bronze Saddles

215 East 26th Street, New York, N. Y.

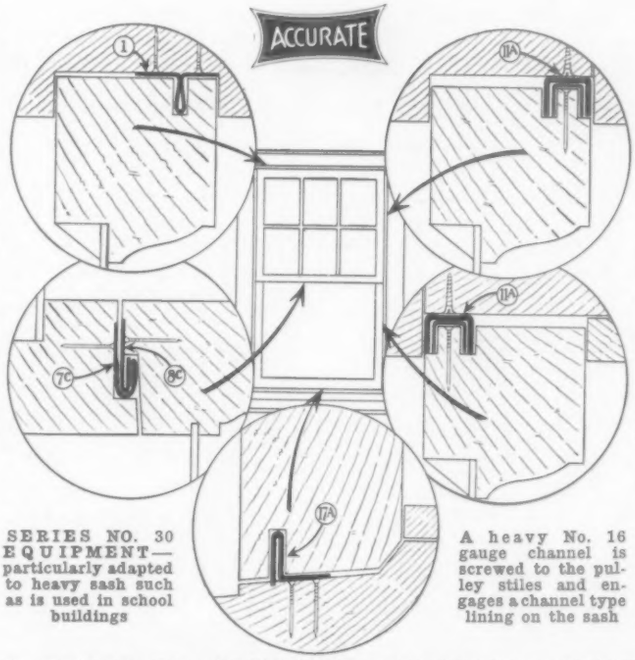
DISTRIBUTORS IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES

Efficient Equipment for All Types of Wood and Metal Windows and Doors

The wide range of types and sizes of ACCURATE Metal Weather Strips places us in an ideal position to co-operate with school architects and executives in meeting their requirements. We are also in a position to make special dies and equipment for rolling strip to individual specification at a minimum cost.

Types and Quality of Materials: Zinc and bronze are ordinarily used but other metals can be supplied as specified. The sheet zinc used is of purest quality, specially rolled and tempered to our own specifications. In fabricating, the zinc is sheared and formed **across the grain,** adding greater rigidity and resistance to extreme temperature changes than the regular ribbon zinc.

The Company: The Accurate Metal Weather Strip Company has been manufacturing equipment of this kind for thirty-two years, starting in a very modest way and successfully building the business until today it is outstanding in the industry.



SERIES NO. 30 EQUIPMENT—particularly adapted to heavy sash such as is used in school buildings

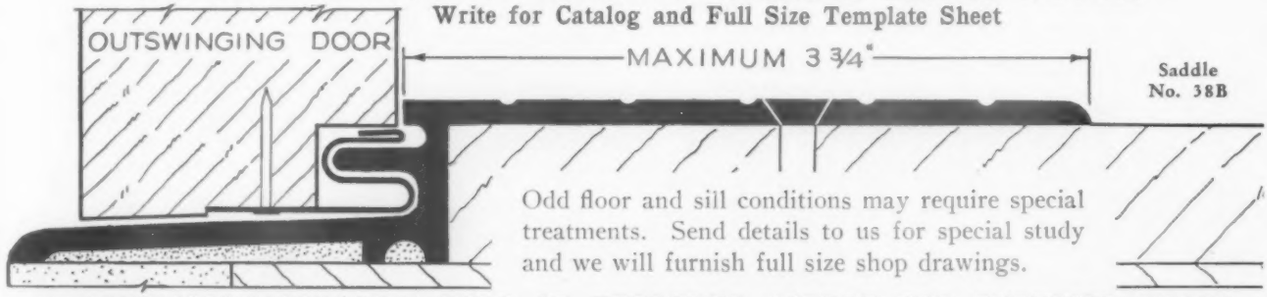
A heavy No. 16 gauge channel is screwed to the pulley stiles and engages a channel type lining on the sash

Manufacturing Facilities: Owing to unusually efficient manufacturing facilities making possible personal supervision and complete control of every step in fabrication, purchasers of ACCURATE Metal Weather Strips are assured of dependable workmanship and prompt service. All departments are located under one roof in a completely equipped modern seven-story fireproof building owned by the Company.

Architectural Service: Satisfactory results from weather strip depends upon three major factors:—(1) quality of equipment, (2) selection of equipment designed to meet the individual conditions and requirements, and (3) proper installation. Where time permits, we strongly urge that you permit us to submit complete and specific recommendations.

ONE OF MANY TYPES OF ACCURATE EXTRUDED BRONZE SADDLES

Write for Catalog and Full Size Template Sheet



Odd floor and sill conditions may require special treatments. Send details to us for special study and we will furnish full size shop drawings.

A RENEWABLE ABRASIVE TYPE OF EXTRUDED SADDLE FOR EXTERIOR DOORS

FOR FURTHER INFORMATION SEE OUR CATALOG IN SWEET'S

Abrasive renewable at any time.

Use for severe service conditions.

The above view shows a non-slip saddle constructed so that a minimum metal surface is exposed; thus increasing its effectiveness. The abrasive sections are removable and can be replaced when worn

ATHEY COMPANY

6034 West Sixty-Fifth St.

Chicago, Illinois

PERENNIAL WINDOW SHADES
CLOTH-LINED METAL WEATHERSTRIPS
ATHEY SEALTITE CAULKING COMPOUNDS

Athey Perennial

ATHEY DISAPPEARING SKYLIGHT SHADE
ATHEY VENETIAN BLINDS

Information and prices gladly given on request

ATHEY PERENNIAL WINDOW SHADES

Athey Perennial Window Shades are ideal for use in school and college buildings of all kinds, for, being translucent, the shades with the sun on them throw a soft light over the room, giving sunlight without glare, and conserving the eyesight of the pupils.

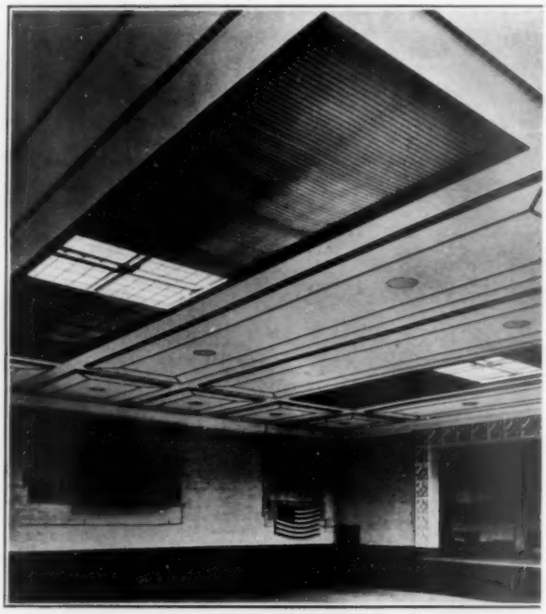
Being instantly adjustable to cover any part of the window necessary, they permit the windows being opened at both top and bottom, insuring better room ventilation, and, operating on bronze guide wires, flapping of shades when window is open is eliminated.

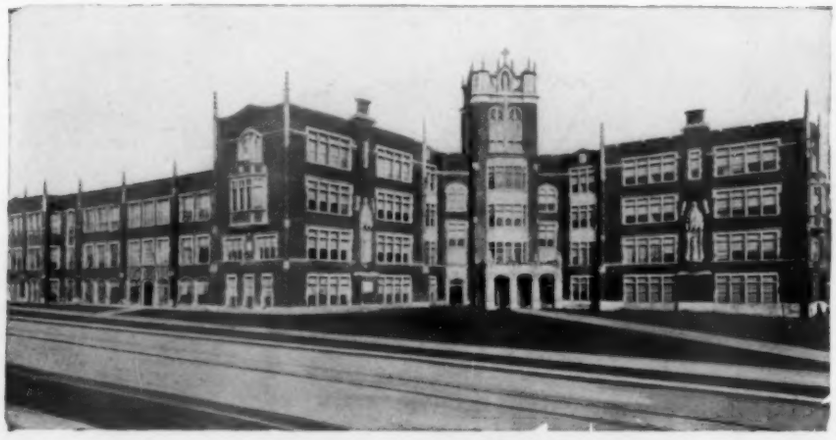
Made of the strongest and most durable material ever used for shades, they last longer than other shades, so on a cost per year basis are the most economical shade obtainable.

They are exceptionally attractive with their cockle finish and pleats, coming in a choice of several colors, and in widths up to seventeen feet.

The black opaque shades are useful for darkening assembly rooms and classrooms for motion picture projection.

Schools, colleges and auditoriums find Athey Shades ideal for skylights, too — the translucent shades for protecting against glare and heat, and the black shades for darkening rooms for motion pictures.





St. Francis Academy, Joliet, Ill.
Every window equipped with Athey Shades

Write for catalog.

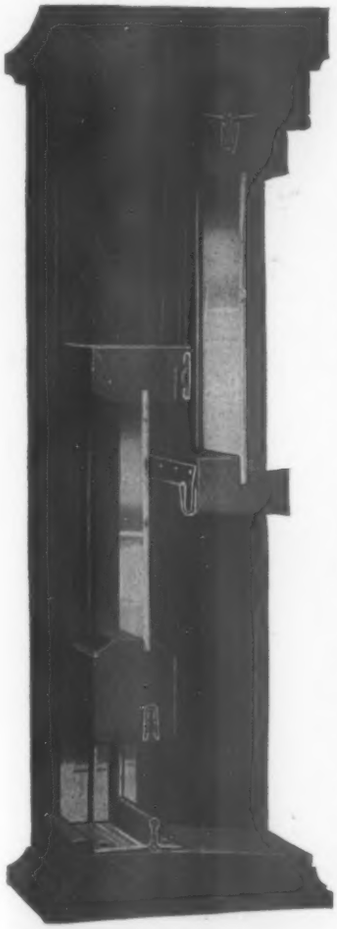
A Few of the Hundreds of Prominent Schools and Colleges Using Athey Shades:

Woodrow Wilson High School	Los Angeles, Calif.
St. Francis Academy	Joliet, Ill.
Saginaw High School	Saginaw, Mich.
State Normal College	Cortland, N. Y.
Junior Senior High School	Rye, N. Y.
Adelphi College	Garden City, N. Y.
The Choate School	Wallingford, Conn.
Wm. Penn Charter School	Philadelphia, Pa.
Henry Schaf School	Parma, Ohio
Solomon Juneau School	Milwaukee, Wisc.
Bisbee Public School	Bisbee, Ariz.
University of S. C.	Columbia, S. C.
Arlington School	Spokane, Wash.
University of Hawaii	Honolulu, T. H.
National College of Education	Evanston, Ill.
Nazareth Academy	Kalamazoo, Mich.
Junior High School	Ann Arbor, Mich.
Colt Memorial High School	Bristol, R. I.
Junior-Senior High School	Louisville, Ky.
Steuben High School	Milwaukee, Wisc.
University of Detroit	Detroit, Mich.
Toledo University	Toledo, Ohio
University of Nevada	Reno, Nev.
National College of Education	Evanston, Ill.

ATHEY WEATHERSTRIP

ATHEY Cloth Lined Metal Weatherstrip, the only weatherstrip using the cloth to metal feature, has been on the market for over 28 years. It has been installed on many of the best and largest buildings in the United States and Canada for owners and architects who desire the best, even though the initial cost is higher than for ordinary weatherstrip. Of our early installations we can point to St. Anthony's Hospital of St. Louis and the Blackstone Hotel of Chicago, who are still obtaining the maximum of efficiency after twenty-seven years of service, making the yearly cost low in comparison with cheap, ordinary weatherstrip.

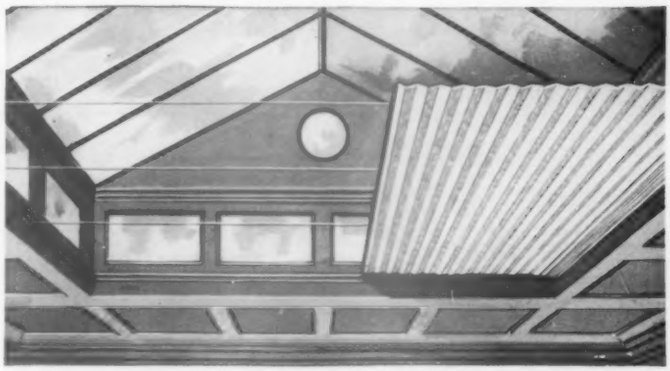
Unlike the ordinary channel used in many two-piece strip installations, the Athey channel is double the ordinary width and lined with a cloth material manufactured especially for this purpose, which not only prevents all air leakage but is a dust-proofing and sound-proofing as well. Rail members are also backed with felt, which prevents leakage at the jamb, a common weakness in ordinary weatherstrip installations due to infrequent nailing of the rail member. All cloth and felt used is chemically treated, guarding against rot and deterioration, so this part of the weatherstrip, as well as the metal, is guaranteed for the life of the building. The best grade of sheet zinc is used on all strip.



No drafts, rattling of sash when Athey strip is used, and the cost of your installation will be repaid in coal savings in from two to three years. Athey Weatherstrip is installed by authorized representatives with trained workmen. Write us for catalog and name of nearest dealer.

A few of the many Schools and Colleges using Athey Weatherstrip:

Streator High School, Streator, Ill.
Western Reserve Academy, Hudson, Ohio
Purdue University, Lafayette, Ind.
Cattaraugus School, Cattaraugus, N. Y.
Johns Hopkins University, Baltimore, Md.
Wesleyan University, Middleton, Conn.
Woodlawn High School, Birmingham, Ala.
Lincoln School, Great Falls, Mont.
Sandia School, Albuquerque, N. M.



Athey Skylight Shades

School lunchroom equipped with Athey Shades

Black Shades in use in Lexington High School, Lexington, Mass.

SEALTITE CAULKING

Knife or gun grade. Permanently elastic, impervious to heat or cold, adheres to wood, stone or metal, stainless. Standard colors white and gray, special colors to order. Approved by U. S. Bureau of Standards for government use. ***Write for Illustrated Booklet.***

COLUMBUS COATED FABRICS CORPORATION

Columbus, Ohio

BONTEX
IMPREGNATED PYROXYLIN . . . GUARANTEED
WASHABLE SHADE CLOTH
Columbus Coated Fabrics Corporation
Bontex is a pyroxylin impregnated shade cloth. It is washable and colorfast. It can be scrubbed over and over again without harm. It does not fray, pinhole or crack. Made in three types—translucent, semi-opaque and opaque—in a wide range of plain colors and beautiful designs.

BONTEX PYROXYLIN SHADE CLOTH is made in three types to **control daylight properly** for all schoolroom purposes. Because Bontex has been developed to provide a more useful everyday service at lowest cost per year, it has been chosen to serve the Nation's finest schools.

Better Daylighting

Controlled daylight with Bontex means light of the right intensity—no sun glare—no disturbing light reflections from varnished, metal or other highly reflective surfaces.

Bontex provides better light, for better vision, for better school work. It conforms to rules suggested by the Eyesight Conservation Council for equipping windows with proper shades that diffuse light and prevent glare.

Durable, Scrubbable, Colorfast!

Better service and longer service make Bontex the ideal schoolroom shade cloth. It's one of the toughest fabrics ever built for the purpose. Not easily damaged by careless handling. Never has been known to pinhole, fray or crack. Can be scrubbed twenty times or more with a brush, soap and water without impairing the quality or original finish.

Tested and approved by the Delineator and Lux Laboratories and proved colorfast by the Florida Test Service. And its dependable quality is guaranteed by the Government label.

Extra Years of Service

A few **pennies** more per shade will buy extra **years** of service when purchasing Bontex. Figuring the cost of cutting, measuring and installing as part of each replacement, there's little to be saved by cutting the quality of shade cloth. The real saving comes by paying a few pennies more per shade for Bontex and avoiding frequent replacements.

Bexley, Ohio, High School
One of many modern school buildings using Bontex Shades. Interior view shows one of the Bexley schoolrooms.

Three Types — 28 Patterns

Bontex TRANSLUCENT shade cloth lets in maximum light without glare. Bontex SEMI-OPAQUE provides a softer, more diffused light. Bontex OPAQUE, absolutely black, excludes all light.

These three types are available in 12 popular plain colors, 5 beautiful corded designs, 5 duplex colors, and 5 modern printed patterns.

FREE Sample Book

We will gladly mail to school officials a Bontex Sample Book so you can see the wide range of patterns and test this superior shade cloth to your complete satisfaction. Write for sample book and complete information

STEWART HARTSHORN COMPANY

ESTABLISHED 1860

250 Fifth Avenue, New York, N. Y.

SUBSIDIARIES

OSWEGO SHADE CLOTH COMPANY
Oswego, N. Y.

CALIFORNIA SHADE CLOTH COMPANY
San Francisco, Calif.

AMERICAN SHADE CLOTH COMPANY
Chicago, Ill., Detroit, Mich. and Columbus, Ohio

WINDOW SHADE CLOTH

WINDOW SHADE ROLLERS

Hartshorn DIANA CLOTH
Washable

Use pyroxylin-impregnated, finest quality, washable Diana cloth for shades in all types of school and college buildings. Wash with soap, water and scrubbing brush. Hartshorn offers a complete line of attractive colors, solid, duplex and striped — translucent and semi-opaque. 144 to 152 threads to the square inch. Hartshorn Diana cloth for window shades conforms to Federal Specification CCC-C-521A.

Hartshorn SPRING SHADE ROLLERS
STANDARD SINCE 1860

Controlling the manufacture of our own wire accounts for the fact that Hartshorn springs do not break down. They stand the gaff of heavy and constant school use.

Both wood and metal rollers are manufactured by Hartshorn. For schools, metal rollers should be specified because of their sturdy construction and excess spring power, added to the fact that they can be used again and again with new sets of shades.

WRITE FOR COMPLETE 16-PAGE CATALOGUE — NO OBLIGATION

BLUE RIDGE GLASS CORPORATION

Kingsport, Tenn.

SPECIFY THE NEW OPTEX WIRE GLASS BLACKBOARD

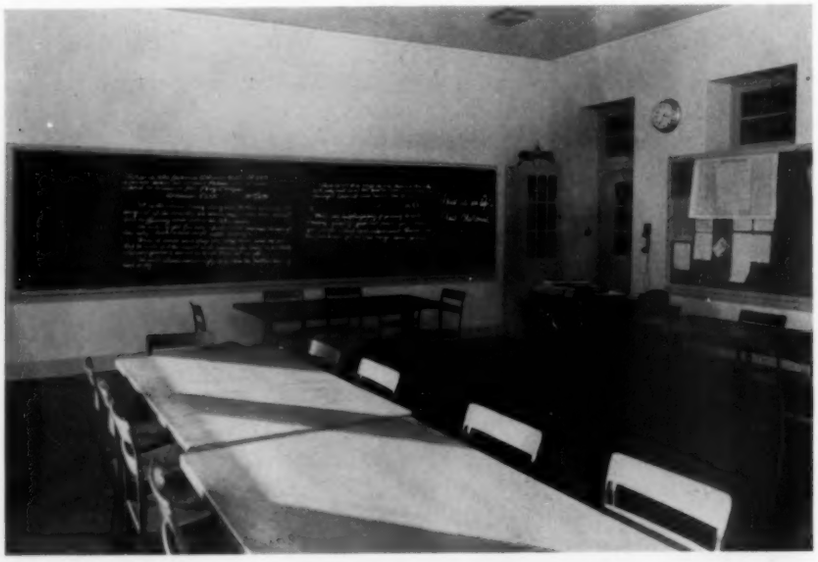
● Employing a brand new principle of construction, Optex Wire Glass Blackboards are so DURABLE that their superb writing surface cannot be worn out in schoolroom use. They are EASY ON THE EYES . . . EASY TO WRITE ON . . . EASY TO CLEAN . . . EASY TO INSTALL.

Optex Wire Glass Blackboards are made of glass—a very hard, non-porous and non-absorbing substance. A structural reinforcement of wire netting, cast in the solid sheet, is concealed by a layer of opaque glass, either black or green, which gives the board its color. Those features and a velvety writing surface give Optex Wire Glass Blackboards these outstanding characteristics:

DURABILITY—A permanent writing surface that does not require periodical and costly refinishing—that is impervious to alcohol, soap, naphtha, ordinary cleaning fluids or common acids. The color will never fade because that layer of glass is fused into the solid sheet behind the writing surface.

UNIFORMITY—Furnished in either black or green in standard lengths of 60″ and any height up to 60″ maximum. (Longer lengths up to 10 feet available on special order.) The standard thickness is approximately 9/32″ and of such uniformity that Optex may be easily set in channels of limited clearance. As there is no variation in shade, selection and matching of color are not necessary.

UTILITY—Optex Wire Glass Blackboards reduce surface glare to an absolute minimum and they are free from "blind spots." This is because the light, which is reflected by the background, has to pass through the diffusing surface twice and thus the intensity of the reflected light is greatly diminished. Therefore, writing can be read without eyestrain from even the most acute angles found in normal schoolroom use. Optex is easy to write on because the velvety finish, mechanically controlled, has an even and pleasant "feel". Painted lines for special classroom work may be removed with paint remover without injury to the writing surface.



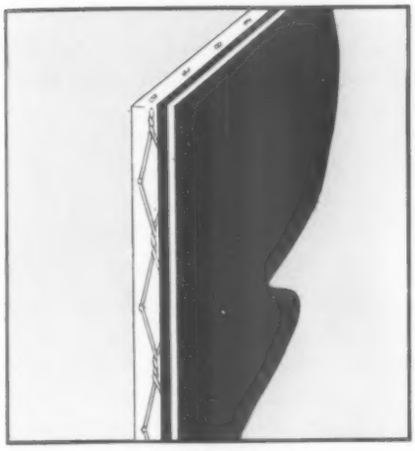
Inglewood High School, Inglewood, Calif.

ECONOMY—In spite of their many superior features, Optex Wire Glass Blackboards are not high priced. Uniformity of size, thickness and color reduce installation costs. They can be cut into smaller sizes with the same ease as any light of wire glass used in building construction.

BLUE RIDGE GLASS CORPORATION

Kingsport, Tenn.

The most practical and serviceable Blackboard ever offered!

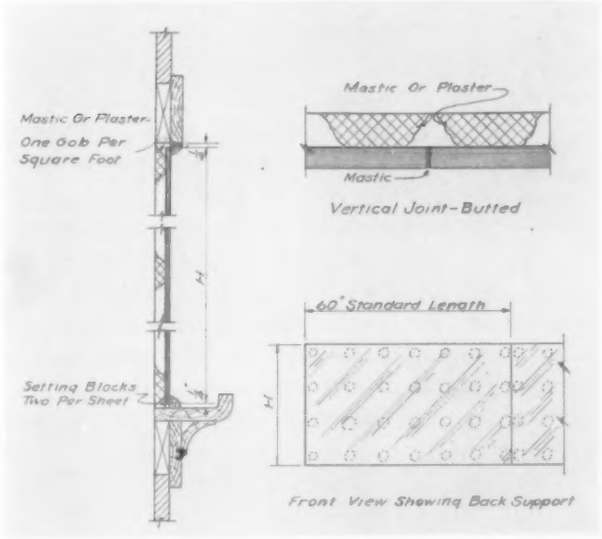


OPTEX WIRE GLASS BLACKBOARDS ARE INGENIOUSLY COMPRISED OF THREE SHEETS OF GLASS CAST SIMULTANEOUSLY—

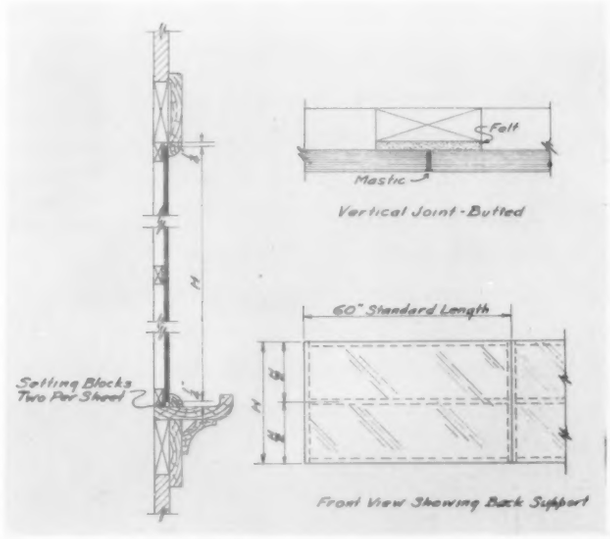
1. A base of clear glass with imbedded wire to reinforce the entire structure, providing a greater safety factor in case of accidental breakage, because the wire tends to hold the fragments together just as it does in wire glass used in skylights.
2. A center of dead-black or green glass.
3. A thin top surface of clear glass ground and treated to provide a velvety writing finish.

While in a molten state during the manufacturing process, these three sheets of glass are fused into one homogeneous unit.

DETAILS OF TYPICAL INSTALLATIONS OF OPTEX WIRE GLASS BLACKBOARDS



Typical installation with mastic



Typical installation with felt

SPECIFICATIONS

All blackboards shall be ———— (black or green—state color desired), "OPTEX," as manufactured by the Blue Ridge Glass Corporation, Kingsport, Tennessee, and distributed by Libbey-Owens-Ford Glass Company, Toledo, Ohio. The manufacturer shall etch the word "OPTEX" on the face of each sheet in the lower left-hand corner.

These blackboards shall be made of glass approximately 9/32" thick. They shall contain a structural reinforcement of wire netting, cast in the solid sheet and completely obscured from writing surface view by an imbedded layer of ———— (black or green—state color desired), opaque glass. The writing surface finish shall be obtained by mechanically controlled machine grinding and subsequent special treatment in the manufacturer's plant.

The blackboard contractor shall install these boards strictly in accordance with the manufacturer's printed instructions and full-size details which hereby become a part of these specifications.

NOTE—Optex is also available without wire in several light colors with a special protective backing.

Optex Wire Glass Blackboards are manufactured by the Blue Ridge Glass Corporation, Kingsport, Tennessee, and distributed by Libbey-Owens-Ford Glass Company, Toledo, Ohio. Write today for complete information.

NATURAL SLATE BLACKBOARD CO

EXECUTIVE OFFICES
Pen Argyl, Pa.

BRANCHES

ATLANTA, GA., 213 Red Rock Bldg.
BIRMINGHAM, ALA., Bankhead Hotel
BUFFALO, N. Y., 116 Hamilton Blvd., Kenmore, N. Y.
CHICAGO, ILL., 737 N. Michigan Ave.
CINCINNATI, OHIO, 3629 Idlewild Ave.
DALLAS, TEXAS, 3012 Douglas Ave.
DETROIT, MICH., 12236 12th St.
KANSAS CITY, MO., 1730 Grand Ave.
LANCASTER, PA., 709 New Holland Ave
MINNEAPOLIS, MINN., 1822 Jefferson NE.
MEMPHIS, TENN., 215 Falls Bldg.
NEW YORK, N. Y., 110 E. 42nd St., Rm. 701
PHILADELPHIA, PA., 244 N. 10th St.
PITTSBURGH, PA., Rm. 208 Investment Bldg.
ST. LOUIS, MO., 302 Board of Education Bldg.
SOMERVILLE, MASS., 43 Prospect St.
WASHINGTON, D. C., 327 Bond Bldg.
NEW ORLEANS, LA., 816 Howard Ave.

NATURAL SLATE BLACKBOARDS

The superiority of natural slate blackboards over any type of composition board is too well known to require any further mention.

The production of blackboard slate is confined to a single small area in Lehigh and Northampton Counties, Pennsylvania. The quarries in these counties produce the best blackboard material on account of the unusually fine cleavage of the slate and the thickness and size of the beds. Up to 1916, the demand for blackboard slate was taken care of by many individual companies independently operating separate quarries. The organization of the majority of these companies in that year to form the **Natural Slate Blackboard Company** has made possible the highest type of production, storage and service facilities, unequaled except by those of the **Structural Slate Company,** which in the field for **other** uses of slate comprises the member quarries of the **Natural Slate Blackboard Company** and others in the same district.

The "Pyramid" Brand, the name given to all slate furnished by the Natural Slate Blackboard Company, was adopted as a trademark and as a guarantee of the enforcement of the most rigid rules of workmanship and inspection in order to assure the best possible selection for the purpose. Calling for "Pyramid" Brand not only provides a selected slate from the best slate beds in the world but assures you of unsurpassed workmanship and delivery service

Facilities and Service of the Natural Slate Blackboard Company

Selected quarries have been specially equipped to develop maximum production of the particular kinds and sizes of slate blackboards for which such quarries are best adapted.

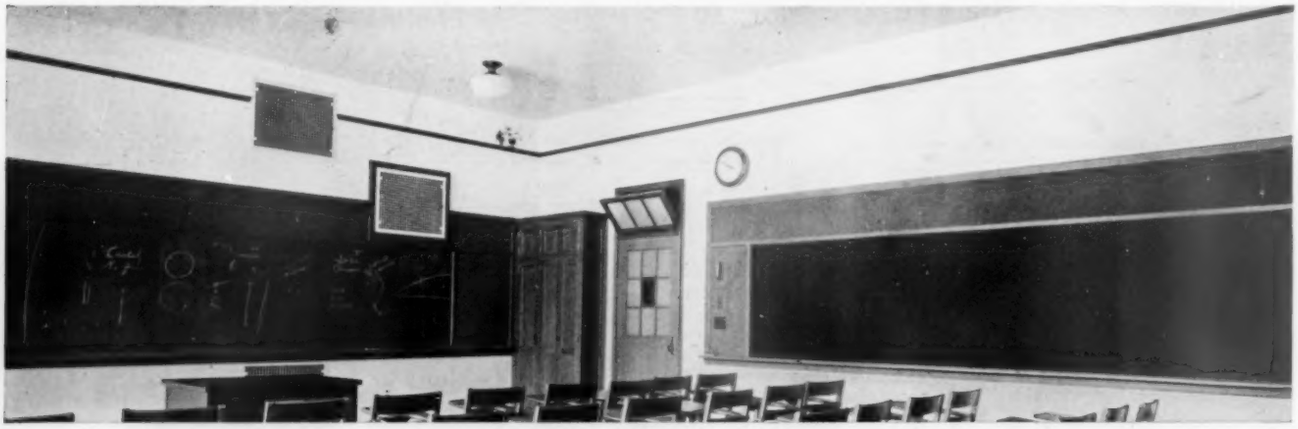
Methods of extraction and storage have been coordinated.

Increased mill production has been facilitated through division of work among these quarries.

This organized procedure enables a huge and constantly moving stock to be always available, from which, without any delays whatever, shipments may be made of any quantity of slate in sizes to meet any requirement.

Each slate blackboard expertly finished, fitted and jointed, assures continued satisfaction through the equipment and service of this Company. The facilities of our Service Department at Pen Argyl and of our branch offices are at the disposal of every user. **Write to, or consult, the branch office nearest you, in regard to any information desired, on "Pyramid" natural slate blackboards or any other uses of slate.**

A minimum of 500,000 sq. ft. carried constantly in stock ensures guaranteed prompt deliveries.



Typical Class Room, Teachers College, Buffalo, N. Y. William E. Haugaard, Commissioner of Architecture, New York State

THE STRUCTURAL SLATE COMPANY

EXECUTIVE OFFICES
Pen Argyl, Pa.

BRANCHES

ATLANTA, GA., 213 Red Rock Bldg.
BIRMINGHAM, ALA., Bankhead Hotel
BUFFALO, N. Y., 116 Hamilton Blvd., Kenmore, N. Y.
CHICAGO, ILL., 737 N. Michigan Ave.
CINCINNATI, OHIO, 3629 Idlewild Ave.
DALLAS, TEXAS, 3012 Douglas Ave.
DETROIT, MICH., 12236 12th St.
KANSAS CITY, MO., 1730 Grand Ave.
LANCASTER, PA., 709 New Holland Ave.
MINNEAPOLIS, MINN., 1822 Jefferson NE.
MEMPHIS, TENN., 215 Falls Bldg.
NEW YORK, N. Y., 110 E. 42nd St., Rm. 701
PHILADELPHIA, PA., 244 N. 10th St.
PITTSBURGH, PA., Rm. 208 Investment Bldg.
ST. LOUIS, MO., 302 Board of Education Bldg.
SOMERVILLE, MASS., 43 Prospect St.
WASHINGTON, D. C., 327 Bond Bldg.
NEW ORLEANS, LA., 816 Howard Ave.

STRUCTURAL SLATE FOR VARIOUS SCHOOL USES

In addition to producing the world's best blackboard slate, Northampton and Lehigh Counties of Pennsylvania also produce an abundant supply of the highest grade structural slate for various other uses. The majority of the quarries in this far-famed slate district cooperate through one organization —the **Structural Slate Company**—in order to develop the most efficient standards of extraction, workmanship, assembling, distribution and methods of installation, as well as to encourage the maximum production and use of slate. All slate produced by this organization is thoroughly inspected before and after working, and is given the trade name of "Pyramid."

"CENTURIES OF SERVICE"
PYRAMID
NATURAL SLATE
STRUCTURAL
Proof against Time - Wear - Water - Fire!

"Pyramid" Brand slate assures the consumer of receiving always the highest quality of slate, selected by experts, and fabricated in any desired size for such uses as toilet enclosures, urinal stalls, shower stalls, laundry tubs, sinks and sink tops, stairways, caps, bases, wainscots and floors. Many standard sizes are always in stock, and deliveries can be made promptly. Normal capacity—5 carloads daily

Structural Characteristics of "Pyramid" Slate

Among the chief characteristics of structural slate from the Pennsylvania quarries are its **fine, even grain,** its **uniform color,** and its **cleavage or fissility,** which allows it to be split into slabs of any required thickness. Slate is also one of the **least absorptive** of nature's products, having a mean absorption of only 174/1000 of one per cent when immersed in water for 24 hours. It is also extremely **tough** and **elastic,** as manifested by its resistance to strain, shock, blows and the effect of settlement. Moreover, it **will not contract or expand** under changing conditions of heat or humidity.

Uses of "Pyramid" Structural Slate in School Buildings

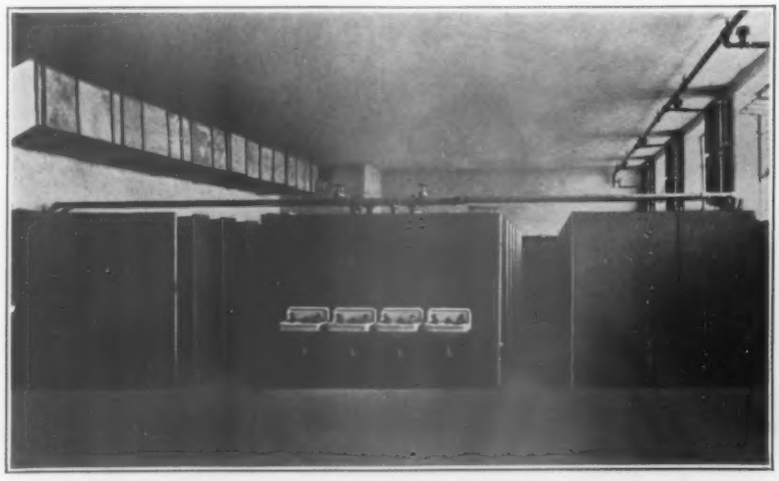
The most common uses of "Pyramid" structural slate in school buildings are for **shower stalls** and **toilet enclosures.** A review of the characteristics of structural slate in the preceding paragraph quickly shows why this slate is admirably fitted for these two uses. In selecting fixtures used for plumbing and sanitary purposes, slate will be found to fulfill easily the most rigid requirements with respect to resistance to wear and tear, sanitary qualities and imperviousness to water.

Other school uses for "Pyramid" Slate include:

BASE TREADS AND PLATFORMS TILE
RISERS SWITCHBOARD PANELS COPING
FLAGGING STOOLS & SADDLES SHELVING
PARTITIONS FLOORS & WALKS THRESHOLDS
URINAL STALLS WINDOW SILLS SINKS & TRAYS
ROOFING SLATE TABLE TOPS RADIATOR TOPS

Write us direct or our nearest Branch Office for estimates and any other information desired.

Use slate for stairways. It is fire-resistant and wear-resistant!



Slate shower installation in High School building, Bethlehem, Pa.

BOLGER-HELLER SLATE CO.

Quarriers and Manufacturers

Bangor, Pa.

SALES REPRESENTATIVES IN THE PRINCIPAL CITIES

GENUINE Paramount SLATE

REG. U. S. PAT. OFF.

ALBION-BANGOR

PRODUCTS

Blackboards	**Stair Treads**
Roofing Slate	**Toilet Enclosures**
Shower Stalls	**Wainscoting**

And structural slate for all requirements

PARAMOUNT VELVET FINISH SLATE BLACKBOARDS

All slate designed for blackboards is subjected to rigid inspection and only clear blemish-free stock is used. This selected slate is polished by machine until it is entirely free of sand pits and of any surface irregularity. The level surface is then gone over carefully by hand. It is this final hand rub that produces the Paramount Velvet Finish—a writing surface of permanent satisfaction.

Facilities: Our quarries and reserve stock are adequate for all demands. Whatever your slate requirements, we invite you to avail yourself of our consulting service.

SPECIFICATIONS COVERING "PARAMOUNT" NATURAL SLATE BLACKBOARDS

QUALITY: All Blackboard Slate shall be quarried in the United States and be of the finest quality selected blackboard stock, even black color, free from veinings or imperfections that would impair its use or durability as a marking surface.

THICKNESS: The thickness of all finished blackboards shall be not less than ¼ inch nor more than ⅜ inch. A maximum deviation of 1/16 inch from this thickness will be permitted when an average thickness of at least ¼ inch is maintained except that double surfaced slate shall be of uniform thickness.

FINISH: The writing face of each blackboard shall be carborundum surfaced to a true, even, uniform and finely smoothed surface. Each blackboard shall be furnished with joints ground straight, true and neatly fitted.

HEIGHT: The height of all blackboards shall be 3′ 0″, 3′ 6″, or 4′ 0″ high (designate which height).

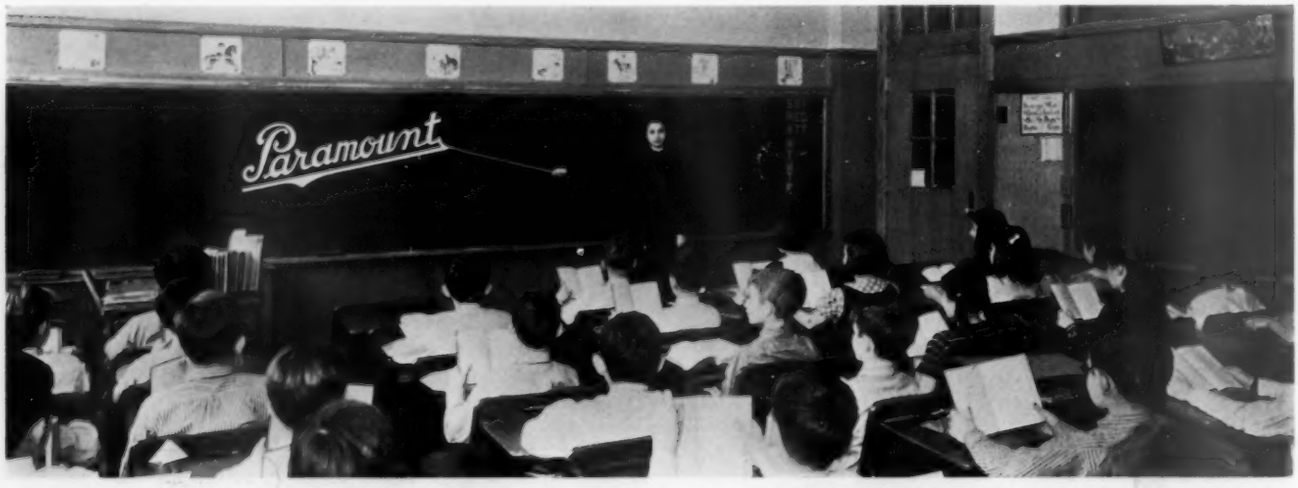
LENGTH: The length or lineal dimensions of the slate in each assembly of blackboards shall be in accordance with the U. S. Department of Commerce Simplified Practice Recommendations No. R15-35, all as follows:

Up to 5 feet, one slab;
Over 5 feet, but not exceeding 9 feet, two slabs;
Over 9 feet, but not exceeding 13 feet 6 inches, three slabs;
Over 13 feet 6 inches, but not exceeding 16 feet, four slabs;
Over 16 feet, but not exceeding 22 feet 6 inches, five slabs;
Over 22 feet 6 inches, but not exceeding 27 feet, six slabs.

JOINTS: The joints in each assembly shall be in accordance with the same Departmental Recommendation, namely, at or near the middle of the space for two slabs, one-third of the space for three slabs, one-fourth of the space for four slabs, one-fifth of the space for five slabs and one-sixth of the space for six slabs.

By "at or near" is meant that any slab may be used which places the joint within three inches in either direction of what would be exact spacing of the units stated.

BOLGER-HELLER SLATE COMPANY, INC.,
BANGOR, PENNSYLVANIA.



A Recent Installation of Paramount Slate Blackboards in a Public School, Brooklyn, N. Y.

NEW YORK SILICATE BOOK SLATE CO., INC.

421 Seventh Avenue, New York, N. Y.

SELOC GLASS CHALKBOARDS FOR PERMANENCE

High School, Lawrence, L. I., N. Y., Completely Equipped with Seloc Glass Chalkboards

A FEW OF THE MANY SCHOOLS USING SELOC GLASS CHALKBOARD

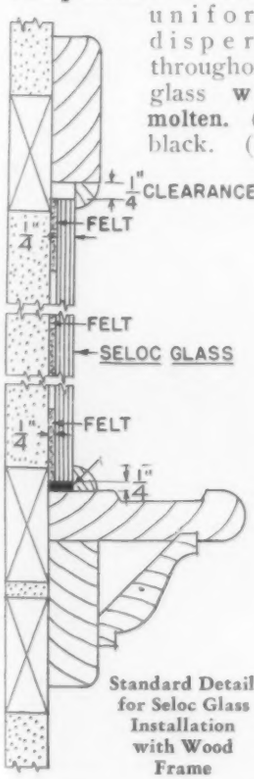
Scarsdale, N. Y.—High School
Washingtonville, N. Y.—High School
Pine Island, N. Y.—Central High School
Peekskill, N. Y.—McKinley High School
Richmondville, N. Y.—Central High School
University of California
Peconic, N. Y.—Peconic Grade School
University of Florida
University of Minnesota
Newton, N. J.—Little Flower Monastery
Waltham, Mass.—High School
South Portland, Me.—High School
Hartford, Conn.—Trinity College
Bayshore, N. Y.—Bayshore High School

ADVANTAGES

Seloc Glass Chalkboard improves with age

(1) Made of black or green plate glass, with a **suspended abrasive** uniformly dispersed throughout the glass **while molten.** (2) Permanently and uniformly black. (3) Permanent velvet finish throughout. (4) Free from irregularities, markings, or scratches. (5) Never wears smooth. (6) No resurfacing ever required. (7) Perfect uniform writing surface. (8) Perfect adhesion of chalk to board. (9) Easily cleaned. (10) Not affected by water, cold or heat. (11) Experimental tests equal to over 100 years of wear have left Seloc Glass Chalkboards as good as new. (12) Non-fading, since color is uniform throughout. (13) Furnished in sizes 3, 3½, 4 x 6 ft. (14) Weight per ft. and purchase price is little more than that of sale.

Some installations have been in for over seven years, demonstrating that the perfect writing texture of the Seloc Glass Chalkboards will never change, and that they never need refinishing or recoloring.



Standard Detail for Seloc Glass Installation with Wood Frame

SPECIFICATIONS FOR SELOC GLASS CHALKBOARDS

(1) Whenever blackboards are specified or indicated on the drawings, the Contractor shall furnish and install 5/16 in. thick Seloc Glass Chalkboards as manufactured by the **New York Silicate Book Slate Co., Inc.,** of 421 Seventh Avenue, New York City.

(2) These chalkboards shall be of a deep black or green color throughout their entire thickness and there shall be uniformly incorporated therein a suitable abrasive material which shall cause the surface to remain permanently of the same uniform texture during the total life of the board.

(3) The sizes of all chalkboards shall be as indicated on the drawings and as hereinafter specified.

(4) All grounds, trim and chalk rails shall be furnished and set by others. The grounds are to be set true and properly secured to walls to adequately support the chalkboards. Quarter rounds or other cover moulds ings are to be fitted by others but installed by the Chalkboard Contractors.

(5) All areas behind chalkboards shall be brown plastered only. The plaster shall be screeded flush with face of grounds to a true and even surface.

(6) The Chalkboard Contractor shall set his chalkboards against a felt cushion ¼ in. thick by 1 in. wide which shall be run along all edges of each slab section. Abutting joints shall be backed with a single 2x¼-in. felt strip running full length of joint. Each section shall be supported on strips of lead or cork ¼ in. thick by ¾ in. wide by about 2 in. long, placed under the board on not over 24-in. centers with not less than three to a board section. Single felt strips ¼ in. thick by 1 in. wide shall be run in a vertical fashion from top to bottom of chalkboard, abutting against the above mentioned marginal felt strips and shall be spaced about 20 in. apart.

(7) Clearances of ¼ in. are to be allowed over and above actual specified chalkboard dimensions, except where two slabs of chalkboard sections are to abut each other.

(8) Where abutting joints occur in chalkboard sections, they shall be fitted as close as possible and Seloc joint compound shall be used only to fill in the joint. When this jointing compound has set, the joints shall be rubbed down with a solution to be furnished by the **New York Silicate Book Slate Co., Inc.,** after which the chalkboards are to be thoroughly cleaned of all foreign matter.

(9) If Neatsnap Extruded-Aluminum Framing is used, see separate specification under that heading.

Norton Door Closers
are manufactured by the
NORTON DOOR CLOSER COMPANY
Division of the Yale & Towne Mfg. Co.
2900 North Western Avenue Chicago, Illinois

"Eighteen years of constant service and still operating perfectly," says J. W. Stevens, speaking of a Norton Door Closer as he points to it doing duty on one of the heavy doors at the Michigan State Normal. Mr. Stevens, superintendent of buildings and grounds of the college at Ypsilanti, Michigan, knows through experience of the dependability of Norton service.

Efficient operation is the only reason for building a door closer. Norton engineers bend their efforts toward building a correctly performing mechanism that functions over long periods of time.

The Norton Door Closers are built on the rack and pinion principle, which controls the entire swing of the door and greatly reduces the strain on the closer, the door and hinges.

One outstanding feature of the Norton Door Closer is the specially engineered packing nut that is absolutely leakproof. This permits the use of mineral oil, which is the correct form of lubrication.

All Norton Door Closer parts are of high quality material. The exactness of manufacturing standards results in an accurate, smooth-working closer.

Consult, without obligation, Norton Door Closer Company which is prepared to recommend a solution for any door control problem. Write for the Norton Catalog.

LCN DOOR CLOSERS

Overhead and Floor Concealed and Surface Closers in 86 Types and Sizes

Manufactured by

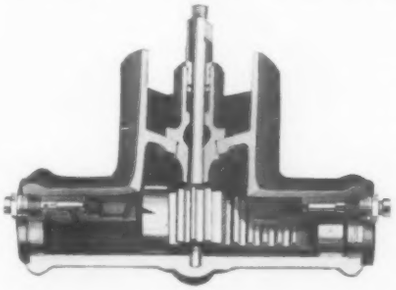
Norton Lasier Company, 466 West Superior Street, Chicago, Illinois

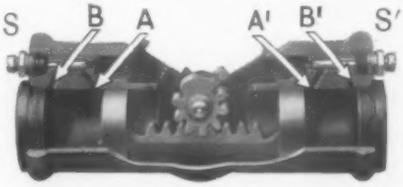
SALES AND SERVICE REPRESENTATIVES IN 25 CITIES

A Complete Line of Closers Providing Smooth, Reliable Control for Every Type of (Swing) Door

Used in Hundreds of Leading Educational Institutions in All Parts of the Country

Are you interested in the "reasons why" of reliable, smooth, low cost door control? Here they are, in brief outline; the main points which have made the LCN Standard Door Closer the success it is today. Every closer in the extensive LCN line incorporates, as far as possible, the basic features of this closer.





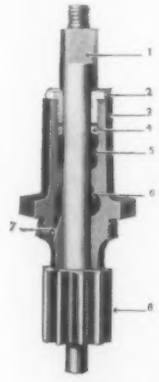
A. The "power plant," an extra large coil spring of special analysis steel (not shown). The reserve power of this coil insures flexible operation and long spring life.

B. Full rack and pinion checking mechanism, completely controlling the door at all times. Highly important to protect door, hinges and closer from the constant shocks which increase wear. Note that the double-headed piston is geared to the shaft, preventing any "dead center" in operation.

C. Leakproof shaft assembly, described below; prevents leakage and development of "play" that leads to destructive wear.

D. Simple system of adjusting screws (S, S') and ports (A, A', B, B' and one in each piston head, by means of which the flow of liquid, controlling the door operation, can be adjusted to a fine point. Swinging and latching speeds adjusted separately.

E. Symmetrical design, with reversible spring. Closer easily changed from right to left hand door operation, or vice versa, without affecting its efficiency.



THE LCN RIGID, LEAKPROOF SHAFT ASSEMBLY

At the heart of a good door closer's design and performance are its power plant (spring) and its main shaft assembly. The latter, in the LCN, has these points of superiority:

1. Shaft, of special steel, ground to one ten-thousandth of an inch.
2. Tobin Bronze Bearing, at point of greatest stress; gives amazing results in efficiency.
3. Shaft Housing: insures rigidity of shaft, consequently smooth operation of closer.
4. Gland Nut; holds packing firmly against shaft and housing, and will last for life of closer.
5. Packing, of graphited flax, between two large bearings, to prevent side thrust and leakage.
6. Air Chamber, to destroy capillary attraction and prevent liquid from reaching packing.
7. Oil Duct, to return to checking cylinder any oil which might creep up shaft.
8. Heavy Duty Gear, with accurately cut teeth; riveted and keyed to shaft, making virtually one piece.
9. Large Bearing (above gear) makes for long life without perceptible wear.
10. Bottom Bearing; insures accurate meshing of gear and rack, therefore uniform motion in closing door.

STANDARD SURFACE TYPE DOOR CLOSER

Six Sizes — A to F

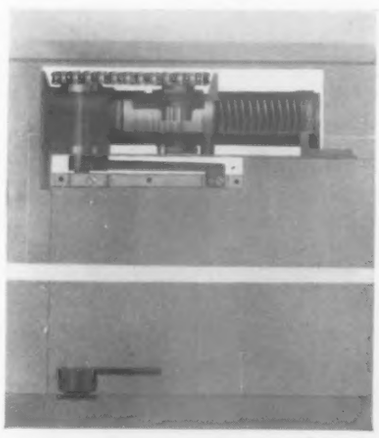
Regular Arm or Hold-open Arm

A Wide Range of Finishes

The basic LCN closer described at left. Product of 50 years' successful experience in door closer design and manufacture. Hundreds of thousands in daily use, giving superior service.

LCN DOUBLE ACTING OVERHEAD CONCEALED CLOSER

Nos. 444 and 466



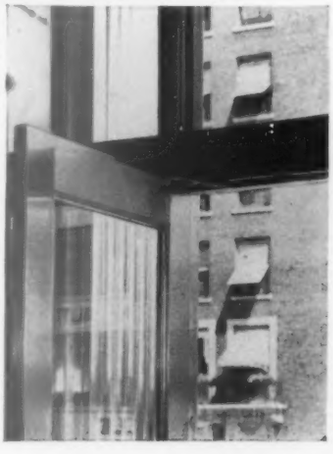
The modern, practical idea of overhead concealment of door closers is here applied to corridor dividing doors, kitchen and other double acting doors.

Closer is fully concealed in head frame. Its ball bearing, full rack and pinion action completely controls the door swinging either way. Allows door to open easily, and prevents sudden "slaps" in closing. Its location is up and away from scrub water and floor dirt, but closer is easily reached for adjustment. Full details on request.

LCN SINGLE ACTING OVERHEAD CONCEALED CLOSER

Nos. 202, 204 and 206

Available with arm that disappears into stop as shown, or with exposed lever arms where full concealment is not needed. The ideal control for entrance and vestibule, and important interior doors.



IN-THE-DOOR AND FLOOR TYPE CONCEALED CLOSERS

The LCN line includes many other types of concealed and surface closers; in-the-door types for light interior doors; single and double acting floor types; for doors hung on butts or pivots. All designed and built by door closer specialists "doing one thing well." Send for complete catalog.

JAS. H. MATTHEWS & CO.

3849 Forbes Field, Pittsburgh, Pa.

BRANCHES

New York, N. Y., 480 Canal Street
Chicago, Ill., 3729 Belmont Avenue
Boston, Mass., 470 Atlantic Avenue
Newark, N. J., 577 McCarter Highway
Birmingham, Ala., 409 N. 23rd Street
Philadelphia, Pa., 401 N. Broad Street
Detroit, Mich., 6476 Moran Street

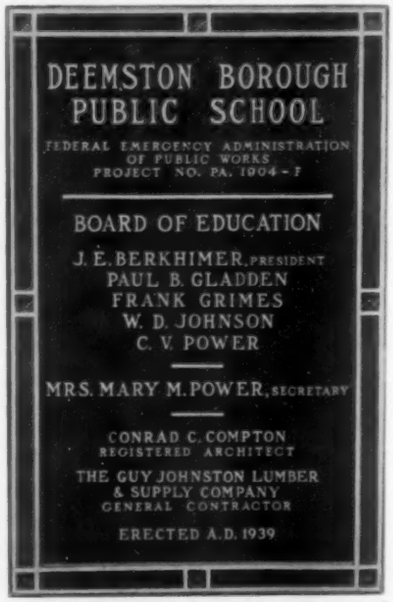
SCHOOL MEMORIALS SYMBOLIZE NOBLE IDEALS

BRONZE or ALUMINUM — **STANDARD or CREATED DESIGNS**

MEMORIALS of Bronze or Aluminum, most beautiful and permanent of metals, have memorialized outstanding lives and events of many schools and universities.

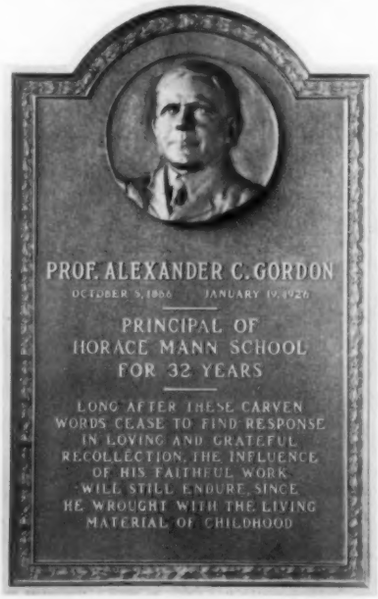
In one school, a founder or benefactor has been memorialized . . . in another, the memorial to a college president inspires the daily lives of students. Here, an Honor Roll memorializes the names of presidents . . . instructors or students, . . . there, trophies of honor were presented for development in research, scholarship or athletic ability.

Whatever the memorial, made by Matthews it will be most appropriate and of the finest craftsmanship. Master patterns make it inexpensive, or we will work from a design created by you. Tell us the approximate size and wording and we will promptly send literature, sketches, and prices.



ADAMS 205 DESIGN. Illustration 18″ x 28″. Other standard patterns available 18″ x 12″, 18″ x 24″, 26″ x 14″, 30″ x 20″ and 36″ x 30″

SIMMONS DESIGN. Size shown 28″ x 40″. Specially modeled design made any size to meet requirements



UNION 334 DESIGN. Size 24″ x 38½″. Illustrates the ability of our sculptor to put the personality of an individual into imperishable bronze, in a bas-relief portrait

TRAFFIC & STREET SIGN COMPANY

Flag Poles Made of Steel, Copper-Bearing Steel, Stainless Steel, Bronze and Aluminum

88 Foundry Street
Newark, N. J.

TELESCOPED SECTIONAL FLAG POLES

Telescoped sectional flag poles are manufactured in three types: **standard, heavy, and extra heavy.** Stock sizes in copper-bearing steel furnished in lengths up to 100 feet in both roof and ground-set poles. Quick delivery can be made on poles up to 200 feet. All the joints are die swaged and shrunk.

CONTINUOUS TAPERED FLAG POLES

Continuous tapered flag poles are manufactured in two types: **Continuous straight taper, and Continuous entasis taper.** Straight tapered poles for roof and ground setting in copper-bearing steel are carried in stock up to 80 feet, and have a standard taper of approximately 1 inch in 7 feet. Quick delivery can be made on entasis taper, special taper, and standard taper poles up to 200 feet.

SAFETY NOTE

Architects working on new school buildings as well as all educational purchasing officials are urged to investigate the advantages for safety of steel as opposed to wood in flag pole construction. Wood poles which to all outward appearances are in good condition may have rotted inside to a point where they are early victims of the next strong blow. Furthermore, a good steel flag pole close to a building is excellent protection against lightning. Steel poles not only safeguard adjacent structures but can also be struck by a bolt without danger of collapse.

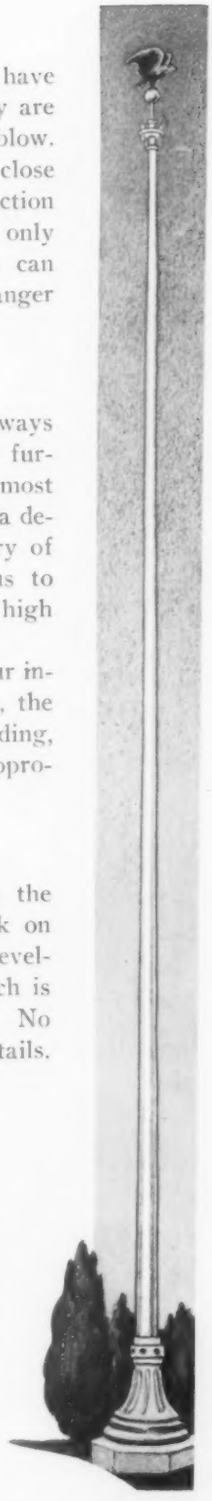
SERVICES OFFERED

Our engineering department is always available to give suggestions and furnish drawings or sketches of the most economical and best suited pole for a desired location. Our large inventory of stock ornamental bases enables us to submit suitable designs eliminating high pattern costs.

It is well to submit to us with your inquiry the size or plan of the plot, the size and height or detail of the building, and the approximate extent of the appropriation.

SPECIAL FEATURES

Our revolving halyard truck is the only fully machined life-time truck on the market. Recently, we have developed a new type of field joint which is absolutely leakproof and foolproof. No caulking is necessary. Write for details.



TRAFFIC CONTROL SIGNS

The widespread publicity given in recent months to the accident toll on the nation's highways has made the average driver more "safety-conscious," particularly in congested and restricted areas. But the out-of-town motorist must be informed he is approaching a school district so that he can reduce speed and keep an extra sharp lookout. We can furnish a wide variety of "Slow," "Caution," "School Zone" signs to help provide the necessary all-day protection.

We can also furnish Parking Regulation signs and all types of posts and fittings

JOHN E. LINGO & SON, INC.

Established 1897

Manufacturers of

Metal Flagpoles

29th Street & Buren Avenue

Camden, New Jersey

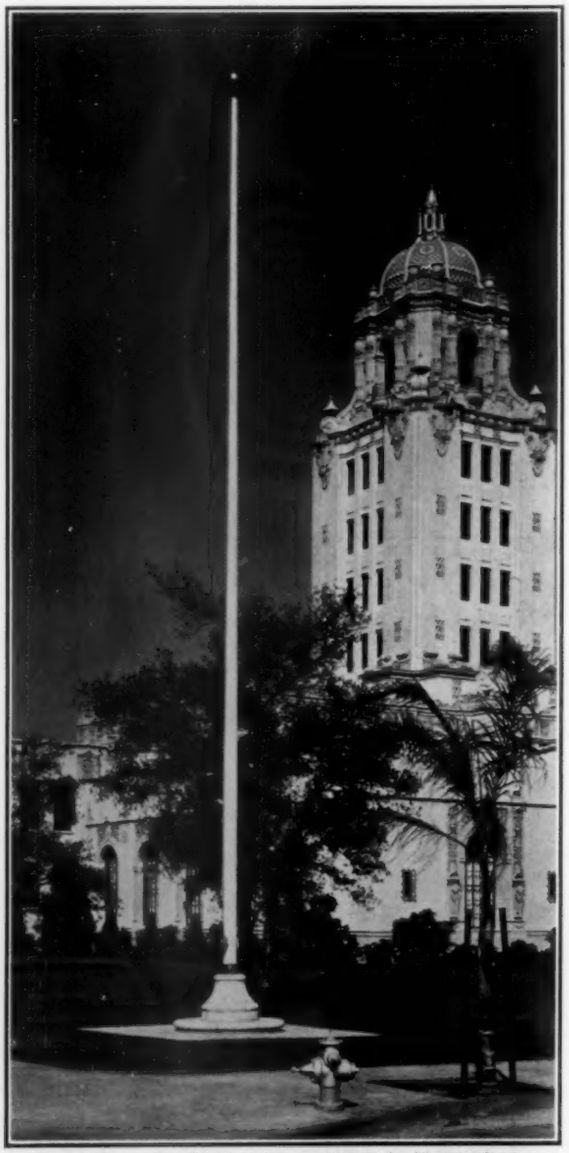
Telephone: Camden 487

TWO DISTINCT TYPES OF STEEL FLAGPOLES

CONTINUOUS STRAIGHT TAPERED FLAGPOLES

Continuous Straight Tapered flagpoles are made of high grade open hearth steel, have a smooth uninterrupted exterior surface throughout without visible joints and offsets, and resemble a finished wooden flagpole in appearance. They are standardized for ground and roof settings in lengths from 20 ft. to 100 ft. These poles are carried in stock and prompt shipments can be made. They are usually shipped in one piece without field joints. To avoid high freight costs, long poles of this type are shipped in two pieces with a machined fit field joint. The erector merely pushes the two sections together at the erection site, welds a small circumferential bead at the joint and then files or grinds the bead smooth, giving the pole an unbroken exterior surface throughout.

Continuous Straight Tapered steel flagpoles are ideal as replacements of wooden flagpoles, for not only is the appearance the same but the steel pole affords lightning protection, unlimited life and dependability not usually found in a wooden flagpole.



50 Feet Above Grade, Continuous Straight Tapered Heavy Type Steel Flagpole, City Hall, Beverly Hills, Calif.

SWAGED SECTIONAL FLAGPOLES

Swaged Sectional flagpoles are fabricated in sections of copper bearing seamless steel pipe with swaged, telescoped and shrunk joints without the use of bolts, rivets, pins, screw couplings or lead calking. They are standardized for ground and roof settings in lengths from 15 ft. to 125 ft. These poles are carried in stock and shipped in knocked down sections with field joints. The erector merely pushes or telescopes the knock-down sections together at the erection site and after the pole is erected the field joints are made airtight and watertight by calking steel to steel with an ordinary hammer and calking chisel.

OTHER PRODUCTS

We also manufacture Continuous Entasis Tapered Copper Bearing Steel, Stainless Steel, Bronze, Nickel Silver and Aluminum flagpoles, standardized for ground or roof settings in various heights and diameters. These poles are especially suitable for monuments, memorials and other buildings of exceptional architectural design. Poles of this type are also standardized for window or outrigger settings.

CATALOGS AND SERVICE

Catalog and Pamphlets giving full information, details, specifications, prices, etc., gladly mailed on application.

Our Engineering Department will gladly assist you in planning your contemplated flagpole installations most satisfactorily and economically, and without obligation on your part whatsoever.

WARNING!

In the interest of safety and for the protection of life and property, we implore Officials to rigidly inspect immediately all their flagpoles now in use.

A wooden flagpole which appears perfect on the outside can be so deteriorated on the inside that only a shell remains and is likely to fall in the next heavy wind. A perfect wooden flagpole offers no resistance to lightning and can readily be destroyed in the next thunder storm.

A steel flagpole improperly designed can fall in a heavy wind or snap off if joined together with screw couplings, flanges, etc.

Protect your property, the general public and particularly children, by removing these hazards now!

Insure against falling poles by installing "LINGO" steel flagpoles. They are properly designed, constructed to safely withstand winds of hurricane force and are natural lightning protectors.

Inspection of Your Flagpoles Now May Save Lives Later!

P. O. MOORE, INC.

300 Fourth Avenue, New York, N. Y.

DISTRIBUTORS IN PRINCIPAL CITIES

KEY CABINETS AND KEY CONTROL SYSTEM

Many millions of dollars are spent annually for locks and keys.

TELKEE

In the modern office building, the hospitals for hundreds of patients, or the schools for thousands of pupils, the problem of maintaining these locks and handling and controlling the keys is a major problem **if the original value and purpose of the locks is to be preserved.**

Demands have been made for a better, a more comprehensive and systematized method of housing and control than the old "key rack"; for a simple, easily operated system that will eliminate the confusion and lack of control of older methods and reduce the rising costs of lock maintenance, variously estimated at from 50¢ to $1.50 per lock per year during the life of the building. TelKee is offered in response to this demand and as a solution of these problems.

PRESERVING THE VALUE AND PURPOSE OF LOCKS

TelKee places the entire key control, preferably, in the General Executive Offices. Here, in cabinets, are kept (1) a reserve pattern or record key to every lock in the building or buildings; (2) all duplicate keys not issued to departments, employees or tenants; (3) signature receipts for all keys issued; (4) cross indexes for efficient handling.

It controls—from the Executive Offices—complete supervision of keys, their issuance to departments and individuals, their recovery and the ordering of necessary duplicates. This control not only includes room and entrance keys, but is easily extended to control keys to all lockers, files, desks, cabinets and similar locked equipment.

Visible Key Control

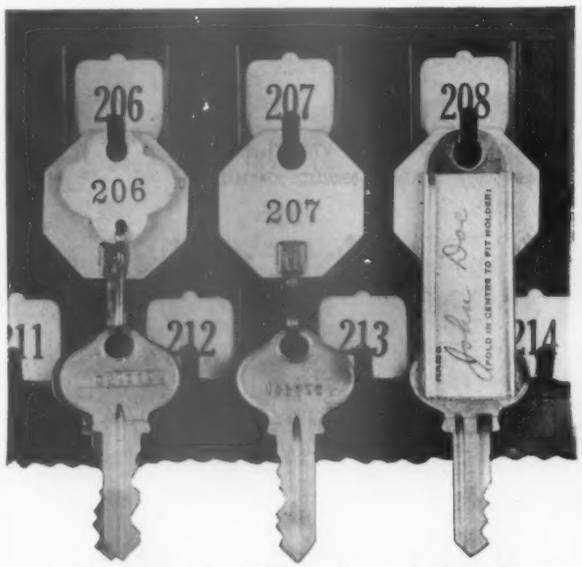
TelKee uses the age-old method of handling keys on hooks. No better method has been evolved. But a small label pocket above and behind each hook has been added to positively identify each hook with a definite lock. In it appears a printed number which identifies it with a room or locker number or a numerical cross index. It adds efficiency to visibility.

TelKee in Operation

On each hook of the TelKee System is maintained at all times a record or "Reserve-Pattern" key to each corresponding lock. It is an emergency key and also the original pattern for cutting all additional keys. It is distinguished by an octagonal red fibre marker die-stamped "File key—must not be loaned" and with die-stamped and enameled lock numbers. This marker has a special brass clasp which when locked on the key cannot be removed, except by intentional destruction. The continued possession of this key eliminates 75% of the present cost of maintaining locks.

Duplicate unissued keys are furnished with Duplicate detachable key markers, clover leaf in shape and numbered to correspond to the "Reserve-Pattern" marker for that particular lock.

Printed Receipt Forms with brass Receipt Holders to hang on hooks are furnished for signature receipts of all keys issued for use.



Hook 206: **Showing "Reserve-Pattern" Key with permanent Marker attached, and two unissued duplicate keys with temporary Marker attached.**

Hook 207: **Showing "Reserve-Pattern" Key. Duplicate keys have been issued with no receipt taken.**

Hook 208: **Showing "Reserve-Pattern" Key, together with Receipt Holder carrying folded Receipt Record for the Duplicate Keys issued.**

Indexes are provided for indexing and cross indexing keys alphabetically, numerically and by manufacturer's lock serial number.

In order that this key control system may be placed in executive offices, TelKee offers a variety of stock cabinets built in high grade furniture steel, to conform with modern office equipment and in individual capacities from 75 to 1400 sets of keys. As many as 1000 sets of keys can be maintained in a space 18x30x12 in.

Standard finish is baked enamel in olive green. Walnut or mahogany finish on order.

All cabinets are equipped with paracentric lock, numerical printed labels for insertion in the label pockets and alphabetical, numerical and lock serial number cross index.

See Next Page

DRAWER FILE CABINET

Specially built in counter height to stand in line with standard office files or to be incorporated in counter equipment. If desired, a sanitary base brings it up to four-drawer letter file height.

Panel drawers operate on roller bearing progressive slide suspensions. Unit paracentric pilaster lock controls all drawers.

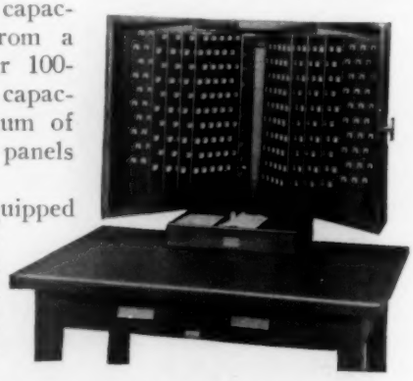
Six-panel drawers are equipped on the sides, with a special device to hold panels firmly in a 45 degree angle position to enhance visibility but permit them to be rocked forward on the bottom edges to a vertical position for convenient handling of keys. Device allows a flexible build-up capacity from a minimum of 4 panels per drawer to a maximum of 12. Each panel is equipped with 2 staggered rows of 10 each combination hook-and-label pockets.

Index drawer has a visible card index panel furnishing 3040 single space typewritten listings each for alphabetical, numerical and lock serial indexing.

HIGH TABLE CABINET

Designed as a less expensive cabinet—but with all features of extreme visibility and accessibility. Specially designed triangular shaped double doors that swing from rear hinges and include the sides of the cabinet. Doors, fully opened, spread 39 in.

Panels swing on pin and socket bearings and are equipped with 100 combination hook and label pockets. Each side of the cabinet which swings with the doors is equipped inside with 50 hook and label pockets. Flexible build-up capacity by panels from a minimum of four 100-hook panels (500 capacity) to a maximum of nine 100-hook panels (1000 capacity).



Regularly equipped with paracentric key in handle lock, blank or serially numbered labels and cross index book.

Designed for use on counter or table but is rigidly reinforced to be **attached to wall if desired.**

TelKee is an annual contract item of the Federal Government and is standard in many States and municipalities; it is in use in Office Buildings, Banks, Schools, Hospitals, Hotels, Apartment Houses; wherever locks are used. Some typical installations are:

FEDERAL AND STATE

Senate and House Office Buildings	Washington, D. C.
Department of Commerce Building	Washington, D. C.
Post Offices and Federal Office Buildings	Coast to Coast
U. S. Veteran and Marine Hospitals	Coast to Coast
U. S. Supreme Court	Washington, D. C.
Harrison County Court House	Clarksburg, Va.
Criminal Courts Building	Cleveland, Ohio
State Capitol Building	St. Paul, Minn.
State Capitol Building	Baton Rouge, La.
New York State Capitol Building	Albany, N. Y.
State Capitol Building	Hartford, Conn.
Norfolk State Prison Colony	Norfolk, Mass.
Criminal Courts Building	Chicago, Ill.
Ramsey County Court House	St. Paul, Minn.
State Capitol Building	Olympia, Wash.

etc., etc.

BANKS

Baltimore County	Baltimore, Md.
Bank for Savings	New York, N. Y.
Dime Savings	Brooklyn, N. Y.
Federal Reserve	Los Angeles, Calif.
Federal Reserve	Pittsburgh, Pa.
First Central Trust	Akron, Ohio
First National	Oklahoma City, Okla.
Irving Trust	New York, N. Y.
National City	New York, N. Y.
National Newark and Essex	Newark, N. J.
Philadelphia Savings Fund	Philadelphia, Pa.
Pacific National	San Francisco, Calif.
Second National	Boston, Mass.

etc., etc.

OFFICE BUILDINGS

American Insurance Company	Newark, N. J.
American Security & Trust	Washington, D. C.
Board of Trade	Chicago, Ill.
Baltimore Trust	Baltimore, Md.
Bankers	Milwaukee, Wisc.
du Pont	Wilmington, Del.
Milwaukee Gas Light	Milwaukee, Wisc.
National Red Cross	Washington, D. C.
Northern States Power	St. Paul, Minn.
No. 1 Wall Street	New York, N. Y.
Professional	Phoenix, Ariz.
Rockefeller Center	New York, N. Y.
Shell Building	San Francisco, Calif.
Wilshire Professional	Los Angeles, Calif.

etc., etc.

UNIVERSITIES AND SCHOOLS

Bennington College	Bennington, Vt.
Bard Hall, Columbia	New York, N. Y.
Bloomsburg State Teachers College	Bloomsburg, Pa.
Bucknell University	Lewisburg, Pa.
Bowdoin College	Bowdoin, Me.
College City of New York	New York, N. Y.
College of St. Elizabeth	Convent, N. J.
Cornell University	Ithaca, N. Y.
Central State Teachers College	Edmond, Okla.
Dillard University	New Orleans, La.
Gustavus Adolphus College	St. Peter, Minn.
Hunter College	New York, N. Y.
Holy Cross	Worcester, Mass.
Howard University	Washington, D. C.
Louisiana State University	Baton Rouge, La.
Marquette University	Milwaukee, Wisc.

Northwestern University	Chicago, Ill.
Newark Public School Fine & Applied Arts	Newark, N. J.
Ohio Wesleyan University	Delaware, Ohio
Rollins College	Winter Park, Fla.
Radcliffe College	Cambridge, Mass.
Rutgers University	New Brunswick, N. J.
State College for Women	Tallahassee, Fla.
State Teachers College	Trenton, N. J.
Sterling Memorial Library	Yale
State Teachers College	Moorhead, Minn.
St. Mary's College and Academy	Monroe, Mich.
University of Minnesota	Minneapolis, Minn.
University of Southern California	Los Angeles, Calif.
University of West Virginia	Morgantown, W. Va.

Junior, Senior and Vocational High Schools from coast to coast including standardization for all schools in:

New York, N. Y. — San Francisco, Calif.
Washington, D. C. — Newark, N. J.
Los Angeles, Calif.

HOSPITALS

Alleghany General	Pittsburgh, Pa.
Bellevue	New York, N. Y.
Barnes	St. Louis, Mo.
Childrens Memorial	Chicago, Ill.
Chronic	New York, N. Y.
Cook County Nurses Home	Chicago, Ill.
Charity Hospital	Baton Rouge, La.
De Paul	St. Louis, Mo.
Fairfield State Hospital	Newton, Conn.
Huron Road Hospital	Cleveland, Ohio
Harbor View	Seattle, Wash.
Herman M. Biggs Memorial	Binghamton, N. Y.
Jewish	Philadelphia, Pa.
Medical Building, University of Texas	Galveston, Tex.
Margaret Hague Maternity	Jersey City, N. J.
N. Y. Hospital, Cornell Medical School	New York, N. Y.
Ypsilanti State	Ypsilanti, Mich.

etc., etc.

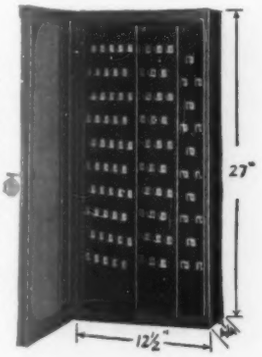
MISCELLANEOUS

Acacia Mutual Life Ins. Co.	Washington, D. C.
Brooklyn Museum	Brooklyn, N. Y.
B. Altman Department Store	New York, N. Y.
Downtown Club	New York, N. Y.
Folger Shakespeare Library	Washington, D. C.
Fox-Wilshire Theatre	Los Angeles, Calif.
Hershey Community	Hershey, Pa.
Jacob Riis Bathing Park	Far Rockaway, N. Y.
John Wanamaker	Philadelphia, Pa.
Los Angeles Stock Exchange	Los Angeles, Calif.
New York City Public Library	New York, N. Y.
National Geographic Society	Washington, D. C.
Northwestern Mutual Life Insurance	Milwaukee, Wisc.
National Archives Building	Washington, D. C.
New York Athletic Club	New York, N. Y.
N. J. Bell Telephone Company	Newark, N. J.
Port of New York Authority	New York, N. Y.
Philadelphia Museum	Philadelphia, Pa.
Pennsylvania Railroad	Philadelphia, Pa.
104th Field Artillery	Jamaica, N. Y.
Radio Corporation of America	New York, N. Y.
St. Louis Globe Democrat	St. Louis, Mo.
S. S. Kresge Administration Building	Detroit, Mich.
San Francisco Opera House	San Francisco, Calif.
The New York World's Fair of 1939	Flushing, N. Y.
Westinghouse	Bloomfield, N. J.

LOW TABLE CABINET

Exactly similar in design to the High Table Model, except in over-all height. Panels have 50 hook and label pockets (25 each side). Insides of doors have each 25-hook and label pockets. Flexible build-up capacity by panels from 300 sets of keys to 500.

WALL CABINET



Fabricated in the same high grade furniture steel as larger cabinets. Fifty-hook panel in the 75-capacity and 100-hook panels in the 150 and 250 capacities. Paracentric key lock 150 and 250 capacities are furnished with a tumble card cross index attached to inside of door. The 75-capacity has an alphabetical sheet index only. Includes labels for insertion in the label pockets.

MULTIPLEX PANEL ADAPTOR UNIT

For large batteries of students lockers. 100 hook panels mounted on an adaptor socket bearing bar for attachment to locker door or direct to wall.

Services

As the TelKee System fits into any desired method of controlling keys, and is recommended by the larger lock manufacturers, many architects specify TelKee for inclusion in General or Building Hardware Contract. For their convenience we maintain a service which will render survey of requirements and cost estimates free of charge.

Specification (Short)

Contractor shall furnish TelKee Central Key Control equipment, or approved equal, for the housing and control of keys to all locks furnished for this building, including appropriate cabinets of sufficient capacity and with "Reserve-Pattern" permanent locking type key markers, Duplicate Key markers, Receipt Holders with Receipt Forms and alphabetical, numerical and lock serial Cross Indexes.

WRITE FOR COMPLETE CATALOG WITH SAMPLES OF TELKEE SYSTEM ACCESSORIES

SECTION III
ARCHITECTS FOR EDUCATIONAL BUILDINGS

All the architects listed in this Directory are now at work on educational buildings or have designed a number of school and college buildings in recent years.

No attempt has been made to evaluate the skill or professional standing of the architects listed. Boards of Education and persons interested in the construction of new buildings can obtain valuable advice in this matter from the presidents of the local chapters of the American Institute of Architects, or from the national headquarters of that organization, The Octagon, Washington, D. C., and from such sources as the National Advisory Council on School Buildings, the United States Office of Education, the respective state departments of education, the Department of Education of the National Catholic Welfare Conference, and the Department of Educational Administration of Teachers College, Columbia University, New York.

Alabama

Birmingham

Charles H. McCauley, Jackson Bldg.
Miller, Martin & Lewis, Title Guarantee Bldg.
Jack B. Smith, Steiner Bldg.
Warren, Knight & Davis, Protective Life Bldg.

Florence

Ben F. Riley, III, 115 E. Mobile St.

Gadsden

Paul W. Hofferbert, 220 S. 8th St.

Montgomery

Dittmar & Roberts, Vandiver Bldg.
John H. Hancock, U. S. Department of Agriculture, Farm Security Administration, Bell Bldg.

Tuskegee Institute

Louis E. Fry, Box 566

Arizona

Phoenix

Lescher & Mahoney, Title & Trust Bldg.

Tucson

Roy W. Place, 11 E. Pennington St.

Arkansas

Fort Smith

Haralson & Mott, Merchants Bank Bldg.
Frederick Wallis Whittlesey, Security Bldg.

Little Rock

Brueggeman, Swaim & Allen, Gazette Bldg.
Erhart & Eichenbaum, Gem Bldg.
Hunter & Boyd, Professional Bldg.
McAninch & Anderson, Insurance Bldg.
Wittenberg & Delony, Pyramid Bldg.

California

Alhambra

Scott Quintin, Edison Bldg.
John Walker Smart, 1200 E. Alhambra Rd.

Altadena

William J. Stone, 736 W. Mariposa St.

Bakersfield

Charles H. Biggar, Haberfelde Bldg.
Symmes & Willard, 1314 17th St.

Berkeley

John J. Donovan, 950 Parker St.
P. L. Dragon & C. R. Schmidts, 2068 Allston Way
W. H. Ratcliff, 2140 Shattuck Ave.

Chico

A. W. Story, 116 W. Second St.

Fresno

W. D. Coates, Rowell Bldg.
Franklin & Kump, Jr., Patterson Bldg.
David Horn, Rowell Bldg.
John Paxton Perrine and Associates, Patterson Bldg. (also in Los Angeles)

Fullerton

Harry K. Vaughn, 324 E. Wilshire St.

Glendale

George J. Adams, 2430 Cascadia Drive
Erwood P. Eiden, 106 E. Wilson St.

Hollywood

H. L. Gogerty, 6272 Yucca St.

Long Beach

Clarence N. Aldrich, 1834 Dawson Ave.
Kirtland Cutter, F. & M. Bank Bldg.
D. Easton Herrald, 1st National Bank Bldg.
Victor E. Siebert, 120 E. 3rd St.

Los Angeles

Allison & Allison, Edison Bldg.
John C. Austin, Chamber of Commerce Bldg.
C. A. Balch, 1584 W. Washington Blvd.
M. L. Barker & G. Lawrence Ott, 624 S. LaBrea Ave.
Richard M. Bates, Jr., 3670 Wilshire Blvd.
Edwin Bergstrom, Citizens National Bank Bldg.
Clifford K. Denman, 311 S. Spring St.
Louis Dorr & Dwight Gibbs, Architects Bldg.
Wesley Eager, 816 W. 5th St.
Ralph C. Flewelling, 816 W. 5th St.
Gable & Wyant, 3723 Wilshire Blvd.
Joseph Kaiser, 5849 S. Van Ness Ave.
Paul Kingsbury, 516 N. Gower St.
T. C. Kistner, 816 W. 5th St.
Samuel E. Lunden, 458 S. Spring St.
Mackie & Squiers, Union League Bldg.
Marsh, Smith & Powell, Architects Bldg.
William Mellema, 1661½ Beverly Blvd.
Richard J. Neutra, 2348 Silverlake Blvd.
Raphael A. Nicolais, 5670 Wilshire Blvd.
Elwin P. Norberg, Board of Education
John Paxton Perrine and Associates, 1031 S. Broadway (also in Fresno)
Harry L. Pierce, 1443 Mt. Pleasant St.
Alfred W. Rea & Chas. E. Garstang, 215 W. 6th St.
A. F. Rosenheim, 1151 S. Broadway
Edward Cray Taylor & Ellis Wing Taylor, 803 W. 3rd St.
Train & Cressey, 321 W. 3rd St.
Van Trees & Schaefer, 560 S. Main St.
Carleton Monroe Winslow, Architects Bldg.
Henry F. Withey, 407 S. Western Ave.
David J. Witmer & Loyall F. Watson, Architects Bldg.
A. C. Zimmerman, 816 W. 5th St.

Los Gatos

E. P. Whitman, 54 Cleland Ave.

Monrovia

Robert M. Finlayson, Central Bldg.

Monterey

C. J. Ryland, 136 Bonifacio Pl.

Palo Alto

Birge M. Clark & David B. Clark, 310 University Ave.

Pasadena

Robert H. Ainsworth, Central Bldg.
Walter C. Folland, 224 S. Oak Knoll Ave.
Elmer Grey, 1372 S. El Molino Ave.
Frederick Kennedy, Jr., 1041 E. Green St.
Marston & Maybury, 25 S. Euclid Ave.

Petaluma

Brainerd Jones, 226 Washington St.

Richmond

Keith O. Narbett, 468 31st St.

Riverside

G. Stanley Wilson, 3616 Main St.

Sacramento

Dean and Dean, California State Life Bldg.
Harry J. Devine, Cronan Bldg.
George C. Sellon, California State Life Bldg.

San Bernardino

E. Charles Parke, Fuller Bldg.
Worswick & Culver, Fuller Bldg.

San Diego

H. Louis Bodmer, Commonwealth Bldg.
Frank L. Hope, Jr., San Diego Trust & Savings Bldg.
Jackson & Hamill, Bank of America Bldg.
William P. Lodge, Fifth Avenue Bldg.
John S. Siebert, Granger Bldg.
William H. Wheeler, Architectural Dept., Unified School District

San Francisco

Bakewell & Weihe, 251 Kearny St.
Arthur Brown, Jr., 251 Kearny St.
Norman R. Coulter, 46 Kearny St.
W. P. Day, H. M. Michelson, Associate, 405 Montgomery St.
Maybeck & White, 235 Montgomery St.
E. L. Norberg, 580 Market St.
Timothy L. Pflueger, 580 Market St.
Frederick H. Reimers, 233 Post St.
Resing & McGuinness, 488 Pine St.
Martin Rist, Phelan Bldg.
N. W. Sexton, De Young Bldg.
Douglas Dacre Stone and Lou B. Mulloy, 381 Bush St.
William H. and Harold H. Weeks, 593 Market St.

Santa Ana

Fay R. Spangler, Spurgeon Bldg.

Santa Barbara

E. Keith Lockard, 117 E. De la Guerra St.
Soule & Murphy, 116 E. Sola St.

Santa Maria

Louis N. Crawford, Gibson-Drexler Bldg.

Santa Paula

Roy C. Wilson, Box 951

Santa Rosa
C. A. Caulkins, Jr., Rosenberg Bldg.
William Herbert, Rosenberg Bldg.

South Pasadena
A. S. Nibecker, Jr., 1624 Bushnell Ave.

Stockton
Elmore G. Ernst, 561 E. Harding Way
Victor Galbraith, 221 E. Acacia St.
Frank V. Mayo & Eric Johnson, 931 N. Eldorado St.

Ventura
Harold E. Burket, 468 E. Main St.

Whittier
R. L. Warren, Box 134

Colorado

Boulder
G. H. Huntington, Box 52

Colorado Springs
Charles E. Thomas, Colorado Springs National Bank Bldg.

Denver
Atchison & Emery, 1254 Monaco Pkwy.
J. B. Benedict, 1669 Broadway
William N. Bowman, Inc., Insurance Bldg.
T. H. Buell & Co., 730 14th St.
H. W. J. Edbrooke, Tabor Bldg.
Fisher, Fisher and Hubbell, Denver National Bldg.
Robert K. Fuller, Insurance Bldg.
Eugene G. Groves, Temple Court Bldg.
Burnham Hoyt, Colorado National Bank Bldg.
John K. Monroe, 22nd & Broadway
Earl C. Morris, Midland Savings Bldg.
G. Meredith Musick, Security Bldg.
C. Francis Pillsbury, Midland Savings Bldg.
Gordon D. White, 615 Columbine St.

Grand Junction
J. Lewis Ford, 122 N. 6th St.

Greeley
F. W. Ireland, Jr., Colorado State College of Education

Pueblo
Walter DeMordaunt, Thatcher Bldg.
John Gray, 612 Van Buren St.

Trinidad
Francis W. Spencer & Roy W. Vorhees, Turner Bldg.

Connecticut

Bridgeport
Frederick H. Beckwith, 19 Arcade Balcony
Ernest G. Southey, 955 Main St.

Danbury
P. N. Sunderland, Inc., 81 West St.

Hartford
Isaac A. Allen & Son, Inc., 100 Farmington Ave.
Golden, Storrs & Co., 343 Fairfield Ave.
Carl J. Malmfeldt, 36 Pearl St.
William T. Marchant, 36 Pearl St.
John J. McMahon, 187 Barker St.

Litchfield
Ernest Sibley

Middletown
Carl E. Segerberg, 57 Barbara Road
Towner and Lamb, 164 Court St.

New Haven
Brown & Von Beren, Inc., 295 Sherman Ave.
R. W. Foote, 185 Church St.
Joseph A. Jackson, 184 Livingston St.
Norton & Townsend, 405 Temple St.

New London
Fred S. Langdon, 240 State St.
Payne & Keefe, Manwaring Bldg.

Stamford
William J. Provoost & Richard Everett, Jr., 421 Main St.

West Hartford
Russell F. Barker, 17 Staples Pl.

Delaware

Wilmington
Walter Carlson, DuPont Bldg.
Martin & Jeffers, Inc., DuPont Bldg.
Massena & DuPont, 704 Delaware Ave.
G. Morris Whiteside, 2nd, DuPont Bldg.

District of Columbia

Washington
Rhees E. Burket, 726 Jackson Pl.
Albert I. Cassell, Howard University
H. W. Cutler, 1108 16th St., N. W.
Waldron Faulkner, 917 15th St.
Frohman, Robb & Little, Washington Cathedral Offices, Mount St. Alban
Pierson & Wilson, 1621 Connecticut Ave.
Robinson & Williams, 1927 11th St.
Upman & Adams, 808 17th St.
Nathan C. Wyeth, Municipal Architect, District Bldg.

Florida

Daytona Beach
Harry M. Griffin, 309 N. Grandview Ave.

Fort Myers
Nat Gaillard Walker, 1127 First St.

Gainesville
Rudolph Weaver, Peabody Hall, University of Florida

Jacksonville
S. Ralph Fetner, 218 W. Church St.
Mellen C. Greeley, 925 Barnett St.
Max L. Worthley, 605 Ocean St.

Miami Beach
August Geiger, 731 Lincoln Rd.

Ocala
Frank A. Parziale, Robertson Bldg.

Orlando
W. Kenneth Miller, 1115 N. Dixie Ave.

Pensacola
S. J. Welch, 1306 E. Jackson St.
Walker D. Willis, Blount Bldg.
Yonge & Hart, Thiesen Bldg.

St. Petersburg
Henry L. Taylor, Empire Bldg.

Stuart
Bert D. Keck, Krueger Bldg.

Tampa
Frank A. Winn, Jr., 416 Tampa St.

Georgia

Atlanta
Wm. J. J. Chase, 140 Peachtree St.
Edwards & Sayward, 101 Marietta Street Bldg.
Ivey & Crook, Candler Bldg.
Henry H. Jordan, Healey Bldg.
R. Kennon Perry, Mortgage Guarantee Bldg.
Odis Clay Poundstone, Palmer Bldg.
Norman F. Stambaugh, Citizens & Southern Bank Bldg.
Jess Wilhoit, Mortgage Guarantee Bldg.

Augusta
F. Arthur Hazard
Willis Irvin, S. F. C. Bldg.

Brunswick
Francis L. Abreu, Perry Bldg.

Columbus
F. Roy Duncan, 3119 Hamilton Ave.
T. F. Lockwood, Murrah Bldg.

Fitzgerald
Lauren Parrott, 408 E. Central Ave.

Macon
Dennis & Dennis, 556 Mulberry St.
W. Elliott Dunwody, Jr.
Ellamae Ellis League, Grand Bldg.

Rome
Bayard L. Barnwell

Savannah
Cletus W. Bergen, Liberty Bank Bldg.
Levy & Clarke, 203 E. Broughton St.

Idaho

Boise
Tourtellotte & Hummel, Eastman Bldg.
Wayland & Fennell

Lewiston
Hugh Richardson, Weisgerber Bldg.

Nampa
Lee R. Cooke, 1222 1st St., S.

Pocatello
Frank H. Paradice, Jr., Dietrich Bldg.

Twin Falls
Burton E. Morse, Fidelity National Bank Bldg.

Illinois

Alton
James M. Maupin, Commercial Bldg.
L. Pfeiffenberger's Sons, 102 W. 3rd St.

Aurora
Frank B. Gray, 73 S. LaSalle St.
Van der Meer & Skubic, Terminal Bldg.

Barrington
T. Norman Maxon, II.

Bloomington
Lundeen & Hilfinger, Corn Belt Bank Bldg.
Schaeffer & Hooton, Peoples Bank Bldg.

Carbondale
Thos. S. Thompson, Box 123

Champaign
F. E. Berger & R. L. Kelley, Lincoln Bldg.
George E. Ramey & Co., Robeson Bldg.

Chicago
Alfred P. Allen & Maurice Webster, Assoc., 225 N. Michigan Ave.
Armstrong, Furst, and Tilton, 11 S. La Salle St.
Gerald A. Barry, 5202 W. Chicago Ave.
Burnham & Hammond, Inc., 160 N. LaSalle St.
Chatten & Jacobson, 160 N. LaSalle St.
Childs & Smith, 430 N. Michigan Ave.
John C. Christensen, Board of Education, 228 N. LaSalle St.
John D. Chubb, 109 N. Dearborn St.
Edwin H. Clarke & Herbert Banse, Inc., 8 E. Huron St.
Granger & Bollenbacher, 333 N. Michigan Ave.
John Leonard Hamilton, 814 Tower Court
Albert Frederic Heino, 11059 Hale Ave.
Charles Hodgdon & Son, 111 W. Monroe St.
Holmes & Flinn, 8 S. Dearborn St.
Holsman & Holsman, 140 S. Dearborn St.
C. I. Krajewski, 844 N. Rush St.
Godfrey E. Larson Inc., 77 W. Washington St.
Joseph C. Llewellyn Co., 38 S. Dearborn St.
Benj. Franklin Olson, 19 S. LaSalle St.
Clement L. Piontek, 1608 Milwaukee Ave.
James B. Rezny & Adrian Rezny, 2202 S. Crawford Ave.
Monroe R. Sandel, 228 N. La Salle St.

Decatur
S. A. Clausen, Standard Bldg.
F. E. Holmstrand, Decatur Club Bldg.

East St. Louis
John W. Kennedy, First National Bank Bldg.
Knoebel & Pabst, 417 Missouri Ave.

Elgin
R. C. Abell & George E. Morris, Sherwin Bldg.
Leroy W. Thompson, 735 St. John St.

Galesburg
Aldrich & Aldrich, Bondi Bldg.

Highland Park
John S. Van Bergen, 234 Cedar Ave.

Joliet
Webster Tomlinson, Morris Bldg.

Kewanee
John A. Scribbins, 125 N. Tremont St.

Lake Forest
Anderson & Ticknor, Inc., 262 E. Deerpath Ave.

Lincoln
Deal & Deal, Box 406

Metropolis
S. Lester Daly

Moline
M. R. Beckstrom, Reliance Bldg.
William H. Schulzke, Fifth Avenue Bldg.

Mt. Vernon
McCoy and Wilson, First National Bank Bldg.

Murphysboro
R. Z. Gill & Co., 1328½ Walnut St.

Ottawa
Louis H. Gerding, 708 LaSalle St.

Park Ridge
W. F. McCaughey, 3 S. Prospect Ave.

Peoria
Hamilton B. Dox, Lehmann Bldg.
Hewitt, Emerson & Gregg, Alliance Life Bldg.
Jameson & Harrison, Alliance Life Bldg.

Rockford
Bradley & Bradley, Brown Bldg.
Gilbert A. Johnson, 501 7th St.
Raymond A. Orput, Third National Bank Bldg.

Rock Island
Cervin & Stuhr, Safety Bldg.
Benj. A. Horn, Rock Island Bank Bldg.

Springfield
Harry J. Reiger, Security Bldg.

Urbana
Royer & Danely, Lincoln Hotel Bldg.
Smith, Kratz & Strong, 101 S. Broadway
Ernest L. Stouffer, Administration Bldg.

Waukegan
Ekstrand & Schad, 100 S. Genesee St.
Wilbur A. Mullin, 5 N. Genesee St.

Indiana

Anderson
E. F. Miller, Anderson Bank Bldg.
Ernest R. Watkins, Citizens Bank Bldg.

Bloomington
Wm. J. Strain, Allen Bldg.

Brazil
Wayne M. Weber, 123 Logan St.

Cicero
A. A. Faulstich, Box 110

Connersville
Henkel & Hanson, 715½ Central Ave.

Crawfordsville
Carroll O. Beeson, Ben Hur Bldg.

Crown Point
Albert E. Turner, 116 N. East St.

Dana
H. L. Fillinger

East Chicago
Michael S. Bittner & Arnold A. Weitzman, 721 Chicago Ave.
C. I. Botteron, 3616 Main St.
Karl D. Norris, Calumet Bldg.

Evansville
Edwin C. Berendes & Associates, 121 N. W. 4th St.
Harry E. Boyle & Co.
Edward J. Thole, Furniture Bldg.
Charles L. Troutman, American Trust Bldg.

Fort Wayne
Le Roy Bradley, 225 E. Berry St.
A. M. Strauss, Cal-Wayne Bldg.

Frankfort
Leonard & Wolf, Trasher Bldg.

Gary
Joe H. Wildermuth & Co., 527 Broadway

Hammond
L. Cosby Bernard & Co., 7241 Forest Ave.
W. S. Hutton, 5231 Hohman Ave.

Huntington
Robert W. Stevens, 1033 Cherry St.

Indianapolis
D. A. Bohlen & Son, Majestic Bldg.
Everett I. Brown, 148 E. Market St.
Burns & James, 333 N. Pennsylvania St.
Graham & Knowlton, Security Trust Bldg.
McGuire & Shook, Fletcher Trust Bldg.
Pierre & Wright, 333 N. Pennsylvania St.
Geo. F. Schreiber, 2915 N. Pennsylvania St.
C. D. J. Zimmerman, Inc. & Associates, 3538 N. Meridian St.

Kentland
John A. Bruck

Lafayette
Walter Scholer, 1114 State St.

La Porte
George W. Allen & Son, Savings Bank Bldg.

Logansport
Henry C. Wolf, 316 Heath St.

Michigan City
John Lloyd Wright, Long Beach St.

Muncie
Garrard & Keely, 118-A E. Adams St.
Houck & Hamilton, Patterson Bldg.
H. F. Smenner & Associates, 108 E. Washington St.

New Albany
Hawkins & Walker, Elsby Bldg.

Notre Dame
Francis W. Kervick, University of Notre Dame

Richmond
Werking & Son, 2000 E. Main St.

South Bend
Austin & Shambleau, J. M. S. Bldg.
Willard M. Ellwood
Maurer & Maurer, 107 Lincoln Way, E.
Callix E. Miller, Union Trust Bldg.
Ernest W. Young, Sherland Bldg.

Terre Haute
Miller & Yeager, Opera House Bldg.

Vincennes
Sutton & Routt, Citizens Trust Bldg.

Iowa

Ames
Allen Holmes Kimball, 213 Engineering Annex, Iowa State College

Burlington
Robin B. Carswell, Iowa State Bank Bldg.

Cedar Rapids
Mark Anthony, O.R.C. Bldg.
W. J. Brown, Higley Bldg.
Norman Hatton, Higley Bldg.

Council Bluffs
J. Chris Jensen, 305 Broadway

Davenport
Kruse & Parish, Kahl Bldg.
Howard S. Muesse, Davenport Bank Bldg.
Seth J. Temple, Union Bank Bldg.

Decorah
Charles Altfillisch, 126½ W. Water St.

Des Moines
Dougher, Rich & Woodburn, Old Colony Bldg.
Keffer & Jones, Masonic Temple.
Proudfoot, Rawson, Brooks & Borg, Hubbell Bldg.
Oren Thomas, Des Moines Bldg.
Tinsley, McBroom & Higgins, Hubbell Bldg.

Forest City
Thorwald Thorson

Fort Dodge
E. O. Damon, East Mason Bldg.
Frank W. Griffith, Snell Bldg.

Mason City
Hansen & Waggoner, 11½ S. Federal Ave.

Sioux City
Beuttler & Arnold, Insurance Exchange Bldg.
E. R. Swanson, Insurance Exchange Bldg.

Waterloo
M. B. Cleveland, 424 E. 4th St.

Kansas

Abilene
Murray & Cayton, Citizens Bank Bldg.

Clay Center
Hal Wheelock

Emporia
Brinkman & Hagan, Citizens Bank Bldg.
Buck & Keys, Emporia State Bank

Hutchinson
Harold T. English, Nelson Bldg.
McCrackin and Hiett, 308 W. 20th St.
Mann & Co., Wiley Bldg.

Iola
Garrold A. Griffin, 501 S. Washington St.

Kansas City
Jos. W. Radotinsky, Commercial National Bank

Lawrence
Thomas Larrick, 1021 Massachusetts St.

Manhattan
Paul Weigel, Kansas State College

Ottawa
Washburn & Stookey, 220 Main St.

Salina
Chas. W. Shaver, United Life Bldg.

Topeka
Tom I. Nall, State Architect
Cuthbert & Suehrk, 735 Kansas Ave.
Ray L. Gamble, Central Bldg.
W. E. Glover, National Reserve Bldg.
Ralph E. Scamell, National Reserve Bldg.
Louis H. Spencer, Central Bldg.
Thos. W. Williamson Co., National Bank Bldg.

Wichita
Ed. Forsblom, Beacon Bldg.
Clarence C. Robinson, 540 S. Madison St.
Glenn A. Schafer, 1302 University Ave.
Lorentz Schmidt, 1805 E. 2nd St.
Glen H. Thomas, 125½ N. Topeka Ave.

Winfield
Wm. N. Caton, 318 East 9th St.

Kentucky

Ashland
H. Clell Hayes, 515 16th St.

Covington
B. T. Wisenall, First National Bank Bldg.

Frankfort
Leo L. Oberwarth & Sons

Hazard
H. A. Spalding

Hopkinsville
John T. Waller, 1700 S. Virginia St.

Lexington
Wm. B. Brock, City Bank Bldg.
H. A. Churchill & Associates, Citizens Bank Bldg.
Frankel & Curtis, McClelland Bldg.
John T. Gillig, Radio Bldg.
Whayne W. Haffler, Russell Cave Road
Hugh Meriwether, Radio Bldg.

Louisville
O. W. Holmes, 3537 River Park Drive
E. T. Hutchings, Heyburn Bldg.
Joseph & Joseph, Breslin Bldg.
D. X. Murphy & Bro., Louisville Trust Bldg.
Otis & Lea, Starks Bldg.
Arthur G. Tafel, 140 S. 3rd St.

Owensboro
Walter Scott Roberts, Masonic Bldg.

Paducah
G. Tandy Smith, Jr., Box 705

Louisiana

Alexandria
C. Errol Barron, Guaranty Bank Bldg.
Herman J. Duncan & Co., Inc., Rapides Bank Bldg.
Max J. Heinberg, Weil Bldg.
Charles T. Roberts, Guaranty Bank Bldg.

Baton Rouge
Bodman & Murrell, Reymond Bldg.

Monroe
H. H. Land
J. W. Smith & Associates, Ouachita Bank Bldg.

New Orleans
William R. Burk, Balter Bldg.
Edgar A. Christy, 703 Carondelet St.
Diboll, Boettner & Kessels, Baronne Bldg.
Favrot & Reed, Nola Bldg.
William T. Nolan, Queen & Crescent Bldg.
Weiss, Dreyfous & Seiferth, Maison Blanche Bldg.
Wogan & Bernard, Baronne Bldg.

Shreveport
Jones, Roessle, Olschner & Wiener, Ardis Bldg.
Edward F. Neild, City Bank Bldg.
Seymour Van Os, Ricou-Brewster Bldg.
J. Cheshire Peyton, Giddens Lane Bldg.

Maine

Augusta
Bunker & Savage, 256 Water St.

Bangor
Crowell & Lancaster, 6 State St.

Lewiston
Harry S. Coombs, 11 Lisbon St.

Portland
Miller & Beal, Inc., 465 Congress St.

Presque Isle
John C. Levasseur, N. Main St.

Maryland

Baltimore
O. Eugene Adams, 329 N. Charles St.
J. A. Ahlers, Roland Park Co., 4810 Roland Ave.
Buckler & Fenhagen, 325 N. Charles St.
Clyde N. & Nelson Friz, Lexington Bldg.
David Harrison Inc., 421 St. Paul Pl.
Henry Powell Hopkins, 10 E. Mulberry St.
Henry G. Perring Co., 10 W. Chase St.
Smith & May, Baltimore Trust Bldg.
Taylor & Fisher, 1012 N. Calvert St.

Cumberland
Robert Holt Hitchins, 108 Washington St.

Hagerstown
A. J. Klinkhart, Franklin Court

Salisbury
Edwin Wilson Booth, Box 888
Malone & Williams

Silver Spring
Donald S. Johnson, 9125 Thornhill Rd.

Massachusetts

Boston
Andrews, Jones, Biscoe & Whitmore, 50 Congress St.
Appleton & Stearns, 53 State St.
J. Williams Beal, Sons, 185 Devonshire St.
Frances D. Bulman, 1078 Boylston St.
Coolidge & Carlson, 89 State St.
Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg.
Frank Irving Cooper Corp., 47 Winter St.
Cram & Ferguson, 248 Boylston St.
Ralph Harrington Doane, 7 Water St.
E. S. Dodge, 148 State St.
M. A. Dyer Co., 1 Beacon St.
Harper & West, 131 State St.
John P. Heffernan, 131 State St.
Henry & Richmond, 12 West St.
Hutchins & French, 11 Beacon St.
Kilham, Hopkins & Greeley, 126 Newbury St.
Edmund I. Leeds, 5 Park Sq.
McLaughlin & Burr, 88 Tremont St.
Maginnis & Walsh, Statler Bldg.
Perry, Shaw & Hepburn, 141 Milk St.
Louis Warren Ross, 9 Park St.
Richard Shaw, 25 Huntington Ave.
George H. Sidebottom, 120 Milk St.

Fall River
Israel T. Almy, 56 N. Main St.
Edward M. Corbett, 49 Purchase St.
Henry Fallows, 131 Stewart St.

Fitchburg
S. W. Haynes & Associates, 336 Main St.

Haverhill
Morse, Dickinson & Goodwin, 25 Washington Sq.

Lawrence
Ashton & Huntress, 477 Essex St.

Leominster
Harold E. Mason, 15 Prospect St.

Lowell
Perley F. Gilbert, 53 Central St.

Lynn
George A. Cornet, 14 Central Ave.

New Bedford
Brown & Poole, 688 Pleasant St.

North Adams
Arthur F. Eldridge, 85 Main St.

Northampton
Frank Mark Mahoney, 199 Main St.

Springfield
D. R. Baribault, 166 Buckingham St.
Gardner & King, 33 Lyman St.
Morris W. Maloney, 220 Dwight St.

Wellesley
Brainerd, Drew, & Villanova, 10 Upland Rd. (Also in Dorchester, Mass.)

West Springfield
Paul Beekman Johnson, 35 Memorial Ave.

Worcester
Lucius W. Briggs Co., 314 Main St.
Edwin T. Chapin, 311 Main St.
Frost, Chamberlain & Edwards, Slater Bldg.
O. E. Nault & Sons, 48 Hamilton St.

Michigan

Ann Arbor
Fry & Kasurin, First National Bank Bldg.

Battle Creek
A. B. Chanel, 9 Merwood Dr.
Lewis J. Sarvis, Bailey Bldg.

Bay City
Joseph C. Goddeyne, Bay City Bank Bldg.

Birmingham
J. Rob't. F. Swanson, 3 9 Wabeek Bldg.

Brighton
Max A. Musch, 3850 Fisher Drive, Round Lake

Dearborn
Bennett & Straight, Schaefer Bldg.

Detroit
Derrick & Gamber, Inc., Union Guardian Bldg.
J. Ivan Dise, 2631 Woodward Ave.
Donaldson & Meier, 1601 Washington Blvd. Bldg.
Aloys Frank Herman & Howard T. Simons, Owen Bldg.
C. R. Jensen, 3757 Gladstone Ave.
Lane-Davenport-Meyer, Donovan Bldg.
Lyndon & Smith, 13700 Woodward St.
McGrath & Dohmen, 3648 Mt. Elliott Ave.
Malcolmson, Calder & Hammond, Inc., 1217 Griswold St.
George D. Mason & Co., 409 Griswold St.
G. M. Merritt & Lyle S. Cole, 1111 Collingwood Ave.
O'Dell & Rowland, Marquette Bldg.
C. William Palmer, 243 W. Congress St.
George L. W. Schulz, Board of Education, 1354 Broadway
Smith, Hinchman & Grylls, Inc., Marquette Bldg.
N. Chester Sorensen Co., Industrial Bank Bldg.
Alex. Linn Trout, Penobscot Bldg.
B. C. Wetzel & Co., Dime Bank Bldg.

Flint
George J. Bachman, Michigan Theatre Bldg.
Ralph T. Dittmer, Sherman Bldg.

Grand Rapids
Roger Allen, Grand Rapids National Bank Bldg.
J. & G. Daverman Company, 40-44 Porter Block.
Knecht, McCarty & Thebaud, Watson Bldg.
Robinson, Compau & Crowe, Michigan Trust Bldg.
Henry H. Turner, Federal Square Bldg.

Hamtramck
S. J. Stachowiak, 11721 Klinger Ave.

Iron Mountain
F. E. & G. F. Parmelee, 1112 Stockbridge St.

Ironwood
N. Albert Nelson, 106 Suffolk St.

Jackson
Claire Allen & Sons, Dwight Bldg.
Frost & Snyder, 407 S. Jackson St. (also at Battle Creek, Mich.)

Kalamazoo
LeRoy & Newlander, Pratt Bldg.
Stewart-Kingscott Co., 208 Elm St.

Lansing
Lee Black & Kenneth C. Black, Capitol Savings & Loan Bldg.
Bowd-Munson Company, Inc., Wilson Bldg.
Warren S. Holmes Co., Olds Tower Bldg.

Mullett Lake
G. Harold Thompson

Muskegon
Stanley Worth Hahn, Muskegon Bldg.

Plymouth
George J. Haas, 243 N. Main St.

Pontiac
L. J. Heenan, Peoples State Bldg.

Port Huron
Walter H. Wyeth, Peoples Bank Bldg.

Royal Oak
Frederick D. Madison, Inc., Washington Sq. Bldg.
Worden & Price, Washington Sq. Bldg.

Saginaw
Samuel C. Allen, Eddy Bldg.
Robert Frantz and James B. Spence, 118 N. Washington St.
Donald A. Kimball, Eddy Bldg.
C. E. Macomber

St. Johns
R. V. Gay, 1½ Clinton Ave.

Wayne
Brender & Beam, 4624 Newberry St.

Ypsilanti
R. S. Gerganoff, 206 N. Washington St.

Minnesota

Albert Lea
LeRoy Gaarder

Duluth
E. F. Broomhall, 2732 London Rd.
Erickson & Co., Alworth Bldg.
Giliuson & Ellingsen, Torrey Bldg.
Thomas J. Shefchik, Glencoe Bldg.
C. H. Smith, Torrey Bldg.

Fergus Falls
Foss & Co.

Hibbing
J. C. Taylor, 902 Minn. St.

Mankato
Pass & Rockey, 124 E. Jackson St.
Ernest H. Schmidt, Coughlan Bldg.

Minneapolis
E. B. Croft, 1004 Marquette Ave.
E. H. Enger, Board of Education, 811 N. E. Broadway
Haxby & Bissell, 1111 Nicollet Ave.
Jacobson & Jacobson, Sexton Bldg.
Larson, McLaren & Leighton, Foshay Tower
Long & Thorshov, Inc., Andrus Bldg.
Pesek & Shifflet, 914 Marquette Ave.

Moorhead
Allen H. Meinecke, First National Bank Bldg.

New Ulm
Albert G. Plagens, 300 N. State St.

St. Cloud
Nairne W. Fisher, Granite Exchange
Louis C. Pinault, Lahr Bldg.

St. Paul
William L. Alban, Endicott Bldg.
P. C. Bettenburg, Inc., 1437 Marshall Ave.
Carl H. Reutow, 306 N. Snelling Ave.
Ellerbe & Co., First National Bank Bldg.
Ray R. Gauger & Co., New York Bldg.
William M. Ingemann, Globe Bldg.
Clarence H. Johnston, Empire Bank Bldg.
Eugene V. Schaefer, Shubert Bldg.
Sullivan & Lund, Liberty Bank Bldg.
Toltz, King & Day, Inc., Pioneer Bldg.

Thief River Falls
Henry C. Eckland & Co.

Winona
Boyum, Schubert & Sorensen, 117 West Third St. (also in La Crosse, Wis.)

Mississippi

Biloxi
John T. Collins, Olivari Bldg.

Gulfport
Shaw & Woleben, M. Salloum Bldg.
Vinson B. Smith, Jr.

Hattiesburg
Landry & Matthes

Jackson
Hull & Drummond, Merchants Bank Bldg.
E. L. Malvaney, Box 941.
R. W. Naef, 411½ E. Capitol St.
N. W. Overstreet & A. H. Town, Standard Life Bldg.
James M. Spain, Deposit Guaranty Bldg.

Meridian
Krouse & Brasfield, Kidder Bldg.

Picayune
Wilfred S. Lockyer, Box 110

Starkville
Stevens & Johnston

Missouri

Clayton
Hal. Lynch, 304 N. Central St.

Jefferson City
John M. Schaper, Central Trust Bldg.

Joplin
B. R. Van Pelt, 625 Empire St.

Kansas City
Samuel W. Bihr, Jr., 912 Baltimore St.
Ernest O. Brostrom, 5828 Wyandotte St.
Carroll & Dean, R. A. Long Bldg.
Felt & Kriehn, 4638 Mill Creek Pkwy.
Edward M. Fuller, 1012 Baltimore Ave.
Hardy & Schumacher, 410 Scarritt Arcade
Frederick C. Gunn, National Fidelity Life Bldg.
Keene & Simpson, 15 W. 10th st.
H. D. Pampel, Finance Bldg.
Sayler & Owen, 1207 Grand Ave.
Joseph B. Shaughnessy, Reliance Bldg.
Chas. A. Smith, 1009 Baltimore Ave.

Moberly
Ludwig Abt

St. Joseph
Walter Boschen, 517½ Francis St.
Eckel & Aldrich
Eugene R. Meier, Bartlett Bldg.

St. Louis
Macon A. Abbitt, 315 N. 7th St.
Bonsack & Pearce, Inc., 411 Olive St.
Marcel Boulicault, Ambassador Bldg.
Ernest T. Friton, Security Bldg.
Hugo K. Graf, 2825 Olive St.
Henry P. Hess, 411 N. 7th St.
Wm. B. Ittner, Inc., 911 Locust St.
Jamieson & Spearl, Arcade Bldg.
O'Meara, Hills & G. E. Quick Associate, 5709 Waterman Blvd.
G. W. Sanger, Commissioner of School Buildings, 911 Locust St.
O. W. Stiegemeyer, 4412 Lindell Blvd.
Study & Farrar, Arcade Bldg.
Arthur J. Widmer & Associates, Inc., Arcade Bldg.

Springfield
Dan R. Sandford, Wilhoit Bldg.

Montana

Billings
Chandler C. Cohagen, Hedden Bldg.
J. G. Link & Co., Electric Bldg.
Edwin G. Osness, 2714 10th Ave., N.
William H. Reid, Jr., 1140 N. 30th St.

Bozeman
Fred F. Willson, Box 497

Butte
Walter Arnold, 1232 W. Granite St.

Great Falls
Cottier & Herrington, First National Bank Bldg.
A. V. McIver, Strain Bldg.
George H. Shanley, First National Bank Bldg.
J. van Teylingen, Medical Arts Bldg.

Havre
Frank F. Bossuot, 133 4th Ave.

Helena
Hugenin & De Kay, 440 N. Benton Ave.

Kalispell
Fred A. Brinkman, Whipps Block

Missoula
H. E. Kirkemo, Lehsou Block

Nebraska

Fremont
George Grabe, 304 E. 6th St.

Grand Island
Gordon Shattuck, Clinic Bldg.

Hastings
K. H. Gedney Co.

Kearney
J. P. Helleberg, 23rd & Central Ave.
McClure & Walker, 2111½ Central Ave.

Lincoln
Fritz Craig, Stuart Bldg.
Davis & Wilson, 525 S. 13th St.
Meginnis & Schaumberg, Federal Securities Bldg.
J. F. Reynolds, 1637 S. 11th St.

North Platte
C. C. Coursey, Neville Bldg.

Omaha
N. R. Brigham, 5404 Western Ave.
Everett S. Dodds, 5011 N. 22nd St.
John Latenser & Sons, Inc., Saunders-Kennedy Bldg.
John & Alan McDonald, Standard Oil Bldg.
Chas. W. Steinbaugh, Brandeis Theatre Bldg.

Scottsbluff
E. L. Goldsmith & Co., 1513½ Broadway
O. J. Hehnke, Box 516.

Nevada

Ely
F. W. Millard & Son, 614 High St.

Reno
DeLongchamps & O'Brien.

New Hampshire

Durham
E. T. Huddleston, University of New Hampshire

Hanover
Jens Frederick Larson.
Wells, Hudson & Granger, Musgrove Bldg.

Laconia
Norman P. Randlett, 614 Main St.

Manchester
C. R. Whitcher, 814 Elm St.

New Jersey

Camden
Byron H. Edwards, 708 Federal St.
Joseph Norman Hettel, 720 Federal St.
F. Herbert Radey, 101 N. 7th St.

Chatham
William A. Pieper, 81 Center Ave.

Cliffside Park
Lucht & Anderson, 432 Palisade Ave.

Elizabeth
Leslie M. Dennis, 333 N. Broad St.
C. Godfrey Poggi, 287 Morris Ave.
Lauren V. Pohlman, 80 Broad St.

Englewood
Lawrence C. Licht, 101 W. Palisade Ave.

Fort Lee
Hacker & Hacker, Main St.

Hackensack
Arthur E. Doré, 332 River St.
George Nordham, City National Bank Bldg.

Hillside
Jacob Wind, Jr., 1444 Broad St.

Irvington
Victor H. Strombach, 1243 Springfield Ave.

Morristown
Arnold Voorhees Cook, 31 Park Place

Newark
Charles F. Ackerman, 105 Halsey St.
J. Frederick Cook, 9 Clinton St.
Guilbert & Betelle, Chamber of Commerce Bldg.

New Brunswick
Alexander Merchant & Son, 1 Elm Row
Newton W. Richards, 46 Bayard St.

Ocean City
Frederick F. Mills, 801 Asbury Ave.

Passaic
John P. Kelly, 157 Prospect St.

Paterson
Fanning & Shaw, 49 Ward St.
Lee & Hewitt, 152 Market St.

Perth Amboy
John Noble Pierson & Son, 313 State St.

Plainfield
Alfred M. Korff, 203 Park Ave.
Ernest T. Brown, 201 E. 5th St.

Princeton
Rolf William Bauhan, Naussau St.

Red Bank
Vincent J. Eck & Godfrey M. Ricci, Broad St. & Harding Rd.

Rutherford
Huesmann & Osborne, 15 Orient Way

Teaneck
B. Francis McGuire, 705 Linden Ave.

Trenton
Harry A. Hill, Broad Street Bank Bldg.
Louis S. Kaplan, 33 W. State St.
Herman L. Mack, 219 E. Hanover St.

Union
Frederick A. Elsasser, 1000 Stuyvesant Ave.

West New York
Frank J. Ricker & Louis A. Apt, Associates, 685 Hudson Ave.

New Mexico

Albuquerque
Brittelle & Ginner, K. of P. Bldg.
Louis G. Hesselden, 403 N. 12th St.

Clovis
Robert E. Merrell, Box 852

Las Vegas
Chas. W. Barrett, 614½ Douglas St

Roswell
Carr & Gardner, 204½ N. Main St.

Santa Fe
Kruger & Clark, Box 1587
John Gaw Meem, Box 628
Gordon F. Street, El Torreon Bldg.

Silver City
E. M. Kolben

New York

Albany
Andrew L. Delehanty, 450 Ontario St.
H. O. Fullerton, 152 Washington Ave.
James A. Galvin, 11 N. Pearl St.
Gander, Gander & Gander, 17 Steuben St.
Thomas L. Gleason, 522 Warren St.
Office of Walter P. R. Pember, 24 James St.
J. Russell White, 109 State St.

Amsterdam
Howard F. Daly, 15 E. Main St.

Auburn
Wallace P. Beardsley, Seward Block

Binghamton
Conrad & Cummings, 99 Collier St.
A. T. Lacey & Sons, 52 Exchange St.
Walter H. Whitlock, 609 Chenango St.,

Brooklyn
Francis J. Berlenbach & Sons, 191 Joralemon St.
Eric Kebbon, Supt. of School Bldgs., New York City, Flatbush Ave. Extension & Concord St.
Henry V. Murphy, 1 Hanson Pl.

Buffalo
Bley & Lyman, 505 Delaware Ave.
Fronczak & Whitman, Court St. Bldg.
Harbach & Kideney, 505 Franklin St.
Albert H. Hopkins, Liberty Bank Bldg.
F. J. & W. A. Kidd, 524 Franklin St.
Daniel G. McNeil, 333 North Dr.
Charles E. Mott, 360 Delaware Ave.
Chester Oakley, 117 W. Tupper St.
Roswell E. Pfohl, 187 Niagara St.
Carl Schmill & Son, Prudential Bldg.

Cortland
Carl W. Clark, State Theatre Bldg.

Elmira
Robert T. Bickford, 215 W. Water St.

Gloversville
W. Brown Van Dreser, 31 W. Fulton St.

Harrison
Robert P. Vignola, 231 Harrison Ave.

Herkimer
R. E. Sluyter, 203 N. Washington St.

Ithaca
Arthur N. Gibb, 302 E. State St.

Jamestown
Raymond A. Freeburg, 1105 W. 3rd St.
Oliver R. Johnson, Fenton Bldg.

Kingston
Gerard W. Betz, 286 Wall St.

Middletown
Robert R. Graham, 25 Prospect St.
E. P. Valkenburgh

Newburgh
Gordon S. Marvel, 56 2nd St.

New York
Adams & Prentice, 15 W. 38th St.
Wesley Sherwood Bessell, 16 E. 52nd St.
William J. Boegel, 13 E. 37th St.
George A. Boehm, 2 W. 45th St.
Clarence Wilson Brazer, 415 Lexington Ave.
Alfred Busselle, 347 Madison Ave.
Elliott L. Chisling, 420 Madison Ave.
Cameron Clark, 101 Park Ave.
Coffin & Coffin, 125 E. 46th St.
Corbett & MacMurray, 130 W. 42nd St.
Crow, Lewis & Wick, 200 5th Ave.
F. Ferdinand Durang, 270 Broadway
Randolph Evans, 140 Nassau St.
Evans, Moore & Woodridge, 101 Park Ave.
Wm. Gehron, 101 Park Ave.
Archibald F. Gilbert, 358 5th Ave.
William S. Gregory, 171 Madison Ave.
W. K. Harrison & J. A. Fouilhoux, 30 Rockefeller Plaza
William E. Haugaard, Commissioner, Division of Architecture, 80 Centre St.
Thomas H. Irving, 15 Park Row
Office of Adolph H. Knappe, 192 Lexington Ave.
Archibald G. Lamont, 156 5th Ave.
William Lescaze, 211 E. 48th St.
Office of Henry J. McGill, 415 Lexington Ave.
W. Philip McGovern, 156 E. 42nd St.
McKim, Mead & White, 101 Park Ave.
Frederick Mathesius, 101 Park Ave.
Mayers, Murray & Phillip, 2 W. 47th St.
Daniel D. Merrill, 11 E. 44th St.
Moore & Hutchins, 11 East 44th St.
Frank J. & Sylvester W. A. Murphy, 280 W. 246th St.
Geo. B. Post & Sons, 101 Park Ave.
Robert J. Reiley, 62 W. 45th St.
James Gamble Rogers, Inc., 156 E. 46th St.
Shreve, Lamb & Harmon, 11 E. 44th St.
Starrett & Van Vleck, 267 5th Ave.
Stearns & Stanton, 160 5th Ave.
Stoughton & Stoughton, 156 E. 42nd St.
Tooker & Marsh, 101 Park Ave.
William B. Tubby, 444 Madison Ave.
T. Visscher & J. Burley, 51 E. 42nd St.
F. B. & A. Ware, 1170 Broadway
Harold G. Webb, 101 Park Ave.
York & Sawyer, 100 E. 42nd St.

Olean
A. W. E. Schoenberg

Plattsburg
Alvin W. Inman, 71 Clinton St.

Poughkeepsie
Edward C. Smith, 39 Market St.

Richfield Springs
Myron A. Jordan, Main St.

Riverdale-on-Hudson, New York City
Dwight James Baum, W. 244th St. & Waldo Ave.

Rochester
Lewis J. Brew, 42 East Ave.
Charles A. Carpenter, Genesee Valley Trust Bldg.
Dryer & Dryer, 2550 East Ave.
William G. Kaelber and L. A. Waasdorp, 311 Alexander St.
George F. Lorenz, 3086 St. Paul Blvd.
Francis R. Scherer, 13 S. Fitzhugh St.

Rome
F. W. & Samuel N. Kirkland, American Block

Southampton
Wm. I. LaFon, Jr., 48 Main St.

Syracuse
Melvin L. & Harry A. King, Denison Bldg.
Randall & Vedder, Sedwick, Andrews & Kennedy Bldg.
D. Kenneth Sargent, Starrett-Syracuse Bldg.
Gordon Wright, City Bank Bldg.

Utica
Bagg & Newkirk, 258 Genesee St.
Edward J. Berg, 704 Washington St.

Valley Stream
Frederic P. Wiedersum, 240 Rockaway Ave.

Vestal
L. J. Kaley, R.F.D. No. 1

Watertown
Office of D. D. Kieff, C. of C. Bldg.

West Hempstead
W. H. Spaulding, 22 Stevens Ave.

Wyandanch
Hugo H. Avolin, Belmont Ave.

North Carolina

Asheville
Lindsey M. Gudger, 52 Carter St.

Charlotte
Louis H. Asbury, Commercial Bank Bldg.
M. E. Boyer, Jr., 202 Latta Arcade
Lucien J. Dale-Warren Mobley, Wilder Bldg.
Chas. C. and Walter W. Hook, Commercial Bank Bldg.
M. R. Marsh, Builders Bldg.
Willard G. Rogers, 103 S. Tryon St.

Durham
Atwood & Weeks, Inc., Southern Fire Bldg.
George Watts Carr, 111 Corcoran St.

Gastonia
Hugh E. White, National Bank of Commerce

Goldsboro
A. J. Maxwell, Jr., Borden Bldg.

Greensboro
W. L. Brewer, United Cigar Stores Bldg.
C. C. Hartmann

Henderson
Eric G. Flannagan

Hendersonville
Erle G. Stillwell, Inc., Box 1056

Hickory
Robt. L. Clemmer, Grant Bldg.
Q. E. Herman, Box 538

High Point
Eccles D. Everhart, 114½ W. Washington St.

Leaksville
James W. Hopper, 234 W. Washington St.

Lenoir
Clarence P. Coffey, Hedrick Bldg.

Louisburg
M. Stuart Davis

Raleigh
Wm. Henley Deitrick, 102 W. Hargett St.
Ross Shumaker, 2702 Rosedale Ave.

Shelby
V. W. Breeze, Box 325

Wilmington
Leslie N. Boney, Murchison Bldg.

Wilson
Chas. C. Benton & Son, National Bank Bldg.
Frank W. Benton
Thomas B. Herman

Winston Salem
Harold Macklin, 620½ W. 4th St.
Northup & O'Brien, Reynolds Bldg.
William Roy Wallace, Reynolds Bldg.

North Dakota

Bismarck
Ritterbush Bros., 209 N. 7th St.

Devils Lake
John Marshall, 205 5th St.

Fargo
Braseth & Houkom, Black Bldg.
William F. Kurke, 1117 13th Ave., N.

Grand Forks
Joseph Bell DeRemer
Theodore B. Wells

Minot
G. H. Bugenhagen
E. W. Molander, First Avenue Bldg.

Ohio

Akron
Henry & Murphy, 247 E. Exchange St.
William Boyd Huff, 34 S. High St.
M. P. Lauer, 31 N. Summit St.

Berea
Mellenbrook & Foley, 26 Front St.

Bowling Green
S. P. Stewart & Son

Bucyrus
William Unger, Box 545

Canton
Charles E. Firestone, 1342 Cleveland Ave., N.W.

Chagrin Falls
D. M. Allison, 19 N. Franklin St.

Cincinnati
Charles Frederick Cellarius, St. Paul Bldg.
Gustave W. Drach, Inc., Union Trust Bldg.
Frederick W. Garber, 616 Walnut St.
Grunkemeyer & Sullivan, 3717 Eastern Ave.
Harry Hake & Harry Hake, Jr., 2400 Gilbert Ave.
E. C. & G. T. Landberg, 114 Garfield Pl.
Potter, Tyler & Martin, 35 East Seventh St.
John F. Sheblessy, 1202 Republic St.
Tietig & Lee, 34 W. 6th St.

Cleveland
Walter G. Caldwell, Engineers Bldg.
Dickerson & Barrett, 3030 Euclid Ave.
Junior W. Everhard, 9219 Clifton Blvd.
Harry A. Fulton, 5716 Euclid Ave.
Hubbell & Benes Co., 4500 Euclid Ave.
Maier & Walsh, 10006 Carnegie Ave.
James William Thomas, 3868 Carnegie Ave.
Warner & Mitchell, Bulkley Bldg.

Cleveland Heights
William Koehl, Heights-Rockefeller Bldg.

Columbus
John Quincy Adams, 55 Lexington Ave.
E. W. Austin, 17 S. High St.
F. F. Glass, 20 S. 3rd St.
Harsh & Davies, 145 N. High St.
R. C. Kempton, 50 W. Broad St.
Edward Kromer, Board of Education, 270 E. State St.
Richards, McCarty & Bulford, 584 E. Broad St.
John P. Schooly, State Architect, State Office Bldg.
Howard Dwight Smith, Ohio State University
Claude W. Youst, 55 E. State St.

Coshocton
Fred D. Jacobs, 514 Main St.

Dayton
Walter A. Rabold, 341 Elmhurst Rd.
Walker, Norwick & Templin, American Bldg.

Elyria
Silsbee & Smith, Turner Bldg.

Forest
Burk & Seebach

Fremont
C. H. Shively, 400½ Croghan St.

Grand Rapids
W. Howard Manor

Hamilton
George W. Barkman, 20 N. Sixth St.

Hillsboro
Henry R. Ervin, 114 N. High St.

Lancaster
Ralph E. Crook, 1027 E. Fifth St.

Lima
Thomas D. McLaughlin & Associates, Dominion Bldg.

Mansfield
Althouse & Jones, Farmers Bank Bldg.
Harry J. Brumenshenkel, Walpark Bldg.
Vernon Redding & Associates, Walpark Bldg.

Massillon
Albrecht & Wilhelm, McClymonds Bldg.

Middletown
Harold W. Goetz, Savings & Loan Bldg.

Nelsonville
William Mills & Son, Box 178

Newark
Merle T. Orr, 77 Granville St.

New Philadelphia
Charles J. Marr

Norwalk
Granville E. Scott, Citizens Bank Bldg.

Portsmouth
DeVoss & Donaldson, 1st National Bank Bldg.

Sidney
F. E. Freytag

Springfield
Eastman & Harman, 2 W. Columbia St.

Steubenville
Fred H. Clarke

Tiffin
Lynn Troxel, Laird Bldg.

Toledo
Britsch & Munger, Nicholas Bldg.
Edwin M. Gee, Board of Education
Gerow & Conklin, 346 Spitzer St.
Jokel-Coy-Thal, 320 Ontario St.
Mills, Rhines, Bellman & Nordhoff, Inc., 518 Jefferson Ave.

Warren
Roy T. Campbell, Park Ave. & High St.
Keich & O'Brien, Union Bank Bldg.

Youngstown
Myron N. Goodwin, Union National Bank Bldg.
Kling and Canfield, 100 E. Rayen Ave.
M. Gilbert Miller, 12 W. Madison Ave.
Charles F. Owsley, 211 N. Champion St.

Oklahoma

Ada
R. F. Ferguson, 100½ E. Main St.
Albert S. Ross, Cummings Bldg.

Ardmore
J. B. White & Sons, Gilbert Bldg.

Bartlesville
Arthur Gorman, 301½ Johnstone Ave.

Chickasha
Paul Harris, 1503 S. 19th St.

Enid
George Blumenauer, Stephenson Bldg.
R. W. Shaw, Bass Bldg.

Kingfisher
Henry C. Jackson

Muskogee
J. J. Haralson, Manhattan Bldg.

Norman
Joe E. Smay, University of Oklahoma

Oklahoma City
Leonard H. Bailey, Colcord Bldg.
Forrest Butler, Terminal Bldg.
Dennis E. Donovan, 101 E. 3rd St.
C. F. Drury, Perrine Bldg.
Edw. L. Gahl, Continental Bldg.
Malcolm Moore, Cotton Exchange Bldg.
Layton & Forsyth, Braniff Bldg.
J. O. Parr, Hales Bldg.
Sorey, Hill & Sorey and Bryan W. Nolan, Associates
Tonini & Bramblet, Cotton Exchange Bldg.
Walter T. Vahlberg, 311 Hightower
Winkler & Reid, Oklahoma Savings Bldg.

Ponca City
G. J. Cannon, Community Bldg.

Shawnee
Hugh W. Brown, Jr., Petroleum Bldg.
A. C. Davis & Sons, 432 N. Broadway

Stillwater
Philip A. Wilber, 315 Knoblock St.

Tulsa
A. M. Atkinson, Thompson Bldg.
Ralph M. Black, Kennedy Bldg.
F. A. Duggan, 1602 S. St. Louis St.
John Duncan Forsyth, 115 E. 18th St.
Koberling & Fleming, 1400 S. Boston Ave.
A. J. Love & Co., Atco Bldg.
Donald B. McCormick, 1238 S. Boston Ave.
Malcolm McCune, 1308 S. Utica St.
Leon B. Senter, Philtower Bldg.
A. Thomson C. Thorne, 1643 S. Florence Pl.

Oregon

Eugene
John Laurin Reynolds, 841 Willamette St.
Graham B. Smith, Willamette St.

Klamath Falls
Howard R. Perrin

Medford
William Laing, U. S. National Bank Bldg.

Portland
Barrett & Logan, 122 N. E. Broadway
John V. Bennes, Lewis Bldg.
A. E. Doyle & Associates, Pacific Bldg.
C. N. Freeman, Concord Bldg.
Francis B. Jacobberger, McKay Bldg.
Jones and Marsh, Woodlark Bldg.
Lawrence, Holford & Allyn, Failing Bldg.
Roald & Schneider, Spalding Bldg.
F. Marion Stokes, Terminal Sales Bldg.
Lee Thomas, Inc., Weatherly Bldg.
Tourtellotte & Phillips, Pearson-Fourth Avenue Bldg.

Salem
Lyle P. Bartholemew, U. S. National Bank Bldg.
Frederick H. Eley, 776 N. 14th St.

Pennsylvania

Allentown
H. F. Everett & Associates, Commonwealth Bldg.
Ruhe & Lange, 12 N. 6th St.

Altoona
Frank Austin Hersh, Commerce Bldg.
Hunter & Caldwell, 3601 Fifth Ave.

Bloomsburg
John A. Schell, 220 W. Main St.

Bradford
Thomas K. Hendryx, Box 213

Canonsburg
George W. Brugger, First National Bank Bldg.

Charleroi
J. C. Brenton & Son, First National Bank Bldg.

Donora
Conrad C. Compton, 4th St. and Thompson Ave.

Doylestown
A. Oscar Martin & Son, Hart Bldg.

Du Bois
Russell G. Howard, Deposit Bank Bldg.

Ellwood City
B. J. McCandless, 239 4th St.

Erie
Geo. E. Eichenlaub, 218 Hess Ave.
Fred A. Fuller, Commerce Bldg.
J. Howard Hicks, 122 W. 7th St.

Esterly
Elmer H. Adams

Forty Fort
L. Verne Lacy, 45 Owen St.

Greensburg
P. A. Bartholomew, First National Bank Bldg.
Robert J. Brocker, Coulter Bldg.
C. H. Sorber, 113 S. Main St.

Harrisburg
C. D. Hasness, 222 Market St.
Lawrie & Green, 111 S. Front St.
James W. Minick, 505 North Second St.
Wm. Lynch Murray, State Street Bldg.
Joseph Lesher Steele, 23 N. 3rd St.

Johnstown
Horace A. Bailey, Fisher Bldg.
H. B. Raffensperger, Johnstown Trust Bldg.
H. M. Rogers, Johnstown Bank & Trust Bldg.

Kittanning
Tillman Scheeren, Jr., Boarts Bldg.

Lake Ariel
Floyd A. Chapman

Lancaster
Henry Y. Shaub, 20½ N. Queen St.

Lewisburg
Malcolm A. Clinger, 33 N. 2nd St.

McKeesport
C. R. Moffitt, Chamber of Commerce Bldg.

Monessen
H. Ernest Clark, 725 2nd St.

Nanticoke
Geo. P. McLane, Woolworth Bldg.

New Castle
W. G. Eckles Co., Lawrence Savings & Trust Bldg.
The Thayer Co., Greer Bldg.

Oil City
Holmes Crosby, Beers Bldg.

Philadelphia
W. Pope Barney, Roy W. Banwell, Associates, Architects Bldg.
Arthur H. Brockie, Architects Bldg.
Horace W. Castor, Architects Bldg.
Irwin T. Catharine, Parkway at 21st St.
Henry D. Dagit & Sons, 1329 Race St.
Davis & Dunlap, Architects Bldg.
Folsom & Stanton, Architects Bldg.
Gondos & Gondos, Architects Bldg.
Francis A. Gugert, Architects Bldg.
Heacock & Hokanson-C. A. Scheuringer, 1211 Chestnut St.
Karcher & Smith, 1520 Locust St.
W. H. Lee, 1505 Race St.
MacKenzie & Blew, Otis Bldg.
Emile G. Perrot, 1405 N. 16th St.
Savery, Scheetz & Gilmour, Stephen Girard Bldg.
Wenner & Fink, 1701 Arch St.
Zantzinger & Borie, Architects Bldg.

Pittsburgh
W. M. Braziell, 323 4th Ave.
Carlisle & Sharrer, Martin Bldg.
Press C. Dowler, Century Bldg.
Farrell, Smith & Bladel, 309 4th Ave.
J. Lawrence Hopp, 508 3rd Ave.
Richard Irvin, 605-508 3rd Ave.
Kaiser, Neal & Reid, 324 4th Ave.
Edward B. Lee, Chamber of Commerce Bldg.
Raymond M. Marlier, Empire Bldg.
William Richard Perry, 2882 W. Liberty Ave.
John H. Phillips, Wabash Bldg.
M. M. Steen, Board of Education, 341 Bellefield Ave.
A. N. Steinmark, Empire Bldg.
Charles M. & Edward Stotz, Jr., Bessemer Bldg.
Robert Maurice Trimble, Commonwealth Building Annex
Harry Viehman, Chamber of Commerce Bldg.

Pottsville
Philip G. Knobloch, 1811 W. Market St.

Reading
W. Marshall Hughes, 147 N. 5th St.
Muhlenberg, Yerkes & Muhlenberg, 5th & Walnut Sts.
Calvin J. Young, 226 N. 6th St.

Sayre
Harry C. Child, 501 S. Keystone Ave.

Scranton
Arthur P. Coon, Union Bank Bldg.
Lester Merritt Davis, Rehrig Bldg.
Davis & Lewis, Scranton Electric Bldg.
Hancock & Willson, Mears Bldg.
Edward V. Rutledge, 148 Adams Ave.

Sharon
Clepper & Clepper, 72 Vine Ave.

State College
Dean E. Kennedy, Glennland Bldg.

Stroudsburg
Rinker & Kiefer

Sunbury
Davis & Rice, Trust Bldg.

Telford
Charles M. Talley, 314 W. Broad St.

Uniontown
H. W. Altman, Fayette Title & Trust Bldg.

Upper Darby
James G. Ludwig, 6650 Market St.

Washington
S. Lloyd Beall, Washington Trust Bldg.

Wilkes-Barre
Office of Thos. A. Foster, Brooks Bldg.
R. M. Herr, 140 S. Main St.
Mack & Sahm, 22 N. Franklin St.
Austin L. Reilly, Bennett Bldg.
Stanley K. Walborn, Second National Bank Bldg.

Williamsport
R. Douglas Steele, 34 W. 4th St.
Wagner and Kosier, 51 W. Third St.

York
F. G. Dempwolf, Cassatt Bldg.
John B. Hamme, 31 W. Market St.
Harry R. Lenker, Schmidt Bldg.
Robert A. Stair, 100 E. Market St.

Rhode Island

Pawtucket
Albert H. Humes, 332 Main St.

Providence
Edward O. Ekman, 72 Weybosset St.
Bernt G. V. Zetterstrom, Public Buildings Dept.
Albert Harkness, Industrial Trust Bldg.
Joseph A. Hickey, 45 Oldham St.
Howe & Church, Turks Head Bldg.
Jackson, Robertson & Adams, Turks Head Bldg.
Milton F. MacIntosh, 44 Franklin St.
C. R. Makepeace & Co., 10 Weybosset St.
Burritt S. D. Martin, 42 Westminster St.

Woonsocket
W. F. Fontaine & Sons, Federal Bldg.

South Carolina

Anderson
Sam M. Cathcart, Box 73
Charles Wm. Fant, 109½ Sharpe St.

Bennettsville
H. D. Harrall, 717 W. Main St.

Charleston
David B. Hyer, Peoples Bldg.
Simons & Lapham, 7 State St.

Clemson
Rudolph E. Lee, Riggs Hall

Columbia
J. B. Urquhart, Central Union Bank Bldg.
Jesse W. Wessinger, Ritz Bldg.

Florence
Hopkins & Baker, 200 West Evans St.

Greenville
J. E. Sirrine & Co., 215 S. Main St.

Lancaster
Julian S. Starr, Box 143

Rock Hill
A. D. Gilchrist

Spartanburg
Harold E. Woodward, Harris Bldg.

South Dakota

Aberdeen
Roland R. Wilcken, Citizens Bldg.

Mitchell
Walter J. Dixon, Medical Arts Bldg.
Floyd F. Kings, Western Bldg.

Rapid City
James C. Ewing

Sioux Falls
Hugill & Blatherwick, Boyce Greeley Bldg.
Perkins & McWayne, Paulton Bldg.
Harold Spitznagel, Western Surety Bldg.

Tennessee

Bristol
R. V. Arnold, 602 Shelby St.

Chattanooga
Crutchfield & Law, 809 Pine St.
Clarence T. Jones, James Bldg.
Gordon L. Smith, Volunteer Bldg.

Johnson City
D. R. Beeson, Sells Bldg.
Leland K. Cardwell

Knoxville
Barber & McMurry, 517½ W. Church Ave.
Baumann & Baumann, 813½ Market St.
R. F. Graf & Sons, Journal Bldg.
Manley & Young
M. E. Parmelee, Cherokee Bldg.

Memphis
George Awsumb, 1792 Forrest Ave.
Walk C. Jones—Walk C. Jones, Jr., Shrine Bldg.
George Mahan, Jr., Sterick Bldg.

Estes W. Mann, Inc., Shrine Bldg.
Walter R. Nelson, 2115 Monroe Ave.
Regan & Weller, Commerce-Title Bldg.

Nashville

Dougherty & Clemmons, Third National Bank Bldg.
Hart & Russell, Hitchcock Bldg.
Granbery Jackson, Jr., Vendome Bldg.
Marr & Holman, Stahlman Bldg.
Eli M. Tisdale, Warner Bldg.

Texas

Abilene

David S. Castle Co.

Alpine

Victor J. Smith, Sul Ross College

Amarillo

Macon O. Carder, Fisk Bldg.
Guy A. Carlander, Box 3158
Emmett F. Rittenberry & Son, Fisk Bldg.
J. Roy Smith, Blackburn Bldg.
Townes & Funk, 1208 W. 10th St.

Austin

Olin Boese and Thomas B. Thompson, 811 W. 12th St.
Arthur Fehr, 109 W. Ninth St.
Giesecke & Harris, 207 W. 7th St.
C. H. Page, Enfield-Gracy Bldg.
Page & Southerland, Nalle Bldg. Annex
Robert Leon White, University of Texas

Beaumont

A. Babin, Perlstein Bldg.
Wallace B. Livesay, San Jacinto Annex
N. E. Wiedemann, American National Bank Bldg.

Brenham

Travis Broesche

Bryan

Atkinson & Sanders, Parker Bldg.

Cameron

J. E. Johnson, Cameron Hotel

Corpus Christi

Brock, Roberts, Anderson, Jones Bldg.
Hamon & Co., Texas Bldg.
Nat W. Hardy, Nixon Bldg.
Westfall & Wade, Nixon Bldg.

Corsicana

Blanding & Horn, Box 384

Dallas

Arthur A. Brown, Mercantile Bldg.
Ralph Bryan, Construction Bldg.
Christiansen & Christiansen, Thomas Bldg.
Eugene Davis, Liberty Bank Bldg.
DeWitt & Washburn, Praetorian Bldg.
Flint & Broad, Burt Bldg.
Herbert M. Greene, La Roche and Dahl, Insurance Bldg.
Bertram C. Hill, Construction Bldg.
M. C. Kleuser, 4231 Gilbert St.
Lang & Witchell, First National Bank Bldg.
C. H. Leinbach, N. Texas Bldg.
Mark Lemmon, Tower Petroleum Bldg.
Walter C. Sharp, Construction Bldg.
Arthur E. Thomas, Construction Bldg.

El Paso

Frazer & Benner, El Paso National Bank Bldg.
Percy McGhee

Fort Worth

W. G. Clarkson & Co., First National Bank Bldg.
Hubert Hammond Crane, 3719 Camp Bowie Blvd.
J. B. Davies & Co., 1312 Hemphill St.
Preston M. Geren, 806½ Burnett St.
E. L. Harshbarger, Independent School District
Wyatt C. Hedrick, Inc., First National Bank Bldg.
C. M. Love & Co., 314 S. Henderson St.
Elmer G. Withers Architectural Co., Inc., Mid-Continent Bldg.
Clyde H. Woodruff, 1929 Hurley Ave.

Galveston

Ben Milam, Trust Bldg.

Goose Creek

L. L. Huie, Box 475

Greenville

Roy Kilmer

Henderson

J. L. Downing, First National Bank

Houston

Campbell & Keller, 6451 Main St.
Lamar Q. Cato, Junior League Bldg.
Joseph Finger, Inc., National Standard Bldg.
Alfred C. Finn, Bankers Mortgage Bldg.
Herbert C. Heath, Bankers Mortgage Bldg.
Hedrick & Lindsley, Inc., Sterling Bldg.
Blum E. Hester, M. & M. Bldg.
Henry F. Jonas & Tabor, Union National Bank Bldg.
Moore & Lloyd, 2503 Westheimer St.
Joseph W. Northrop, Jr., 3940 Main St.
Harry D. Payne, 3908 Main St.
R. G. Schneider & Co., Inc., 911 Stuart Ave.
John F. Staub, 500 Stuart Ave.
Henry Aam Stubee, 3908 S. Main St.
Maurice J. Sullivan, 3901 Travis St.
Swenson, Heidbreder & Bush, 3940 S. Main St.
Wm. Ward Watkins, 5009 Caroline St.
Wirtz & Calhoun, 500 Stuart Ave.

Jasper

W. C. Meador, Box 603

Livingston

Emory S. White, First National Bank Bldg.

Longview

N. L. Peters, Glover-Crim Bldg.
Zimmerman & Morgan, First National Bank Bldg.

Lubbock

Butler-Huseman Co., Box 418
Haynes & Strange, Myrick Bldg.
O. R. Walker, Palace Theatre Bldg.

Marshall

Stanley Brown, Box 209

McAllen

M. L. & T. D. Waller, Rich Bldg.

Palestine

T. Brook Dougherty, 201½ N. Spring St.
O. L. Hazelwood, Link Bldg.
Theo. S. Maffitt, 510 N. Sycamore St.

Paris

Will H. Lightfoot, 4½ N. 21st St.
Smith & Pottenger, Main St.

Port Arthur

Chas. L. Wignall & J. Earle Neff, Box 1105

Rosenburg

Ernest L. Shult

San Angelo

John G. Becker, 203 Western Reserve Bldg.

San Antonio

Adams & Adams, Insurance Bldg.
Atlee B. & Robert M. Ayres, Smith-Young Tower
Leo M. J. Dielmann, 145 North St.
Jno. M. Marriott, First National Bank Bldg.
Will N. Noonan, Builders Exchange Bldg.
Phelps & Dewees & Simmons, Gunter Bldg.

Sweetwater

Don W. Smith, Bluebonnet Hotel Bldg.

Tyler

Gregory & Cates, Gary Bldg.
Shirley Simons, Citizens Bank Bldg.

Waco

Walter Cocke, Jr., & Co., 1503 Franklin Ave.

Birch D. Easterwood & Son, Liberty Bldg.

Wichita Falls

Voelcker & Dixon, Inc., 913½ Indiana Ave.

Utah

Logan

Karl C. Schaub & Son, Arimo Bldg.

Ogden

Hodgson & McClenahan, Eccles Bldg.
Eber F. Piers, 2726 Harrison Ave.

Provo

Ashworth & Markham, 44 W. 2nd St.
Joseph Nelson, 135 E. Center St.

Salt Lake City

James E. Allen & Pope & Burton, Newhouse Bldg.
Ashton & Evans, Beneficial Life Bldg.
Fetzer & Fetzer, Templeton Bldg.
Scott & Welch, Dooly Bldg.

Vermont

Burlington

Frank Lyman Austin, Lyman D. Austin, 240 College St.

Rutland

Arthur H. Smith, Gryphon Bldg.

Virginia

Ashland

L. P. Hartsook

Luray

Mims, Speake & Co.
(also at Front Royal and Arlington)

Newport News

Williams, Coile & Pipino, Melson Bldg.

Norfolk

T. David Fitz-Gibbon, Royster Bldg.
C. A. Neff, Western Union Bldg.
Rudolph, Cooke & Van Leeuwen, Arcade Bldg.

Richmond

Baskervill & Son, Central National Ba k Bldg.
Carneal, Johnston & Wright, Atlantic Life Bldg.
Merrill C. Lee, 110 N. 7th St.
Raymond V. Long, State Board of Education
J. Binford Walford, 103 E. Cary St.
Marcellus Wright & Son, 1103 E. Main St.

Roanoke

Frye & Stone, 110½ W. Church Ave
Smithey & Boynton, 112 W. Kirk Ave.

University

S. J. Makielski, Barracks Rd.

Washington

Aberdeen

Clarence W. George, Becker Bldg.
Charles A. Haynes, Aberdeen Savings & Loan Bldg.

Bellingham

F. Stanley Piper, Herald Bldg.
Wohleb & Stanton, Herald Bldg.

Ellensburg

A. Eugene Fulton, 220 W. 4th St.

Pullman

Stanley A. Smith, State College of Washington

Seattle

Bebb & Gould, Hoge Bldg.
William Mallis, Lyon Bldg.
Earl W. Morrison, Textile Tower
Naramore & Brady, Central Bldg.
Fred B. Stephen, Smith Tower
James M. Taylor, Jr., Arcade Bldg.
Arch N. Torbitt, Lloyd Bldg.

Spokane
Charles I. Carpenter, Old National Bank Bldg.
G. A. Pehrson, Old National Bank Bldg.
George M. Rasque & Son, Washington Trust Bank Bldg.
Rigg & Vantyne, Peyton Bldg.
Whitehouse & Price, Hutton Bldg.

Tacoma
E. J. Bresemann, Perkins Bldg.
Mock & Morrison, Perkins Bldg.
Sutton, Whitney & Dugan, W. R. Rust Bldg.

Vancouver
D. W. Hilborn, 307 E. 10th St.
Donald J. Stewart, 707½ Main St.

Yakima
Newton C. Gauntt, R. # 6
John W. Maloney, Larson Bldg.

West Virginia

Bluefield
Alex B. Mahood, Box 668

Charleston
M. M. Konarski, Quarrier & Morris Sts.
H. S. Kyle, Union Trust Bldg.
Walter F. Martens, Medical Arts Bldg.
Meanor & Handloser, Inc., Payne Bldg.—Lee St.
Hugh Miller Associates, Inc., Gr. Kanawha Bldg.
Tucker & Silling
A. F. Wysong & Co., Virginia Land Bank

Clarksburg
E. C. Holmboe, Empire Bldg.

Fairmont
L. D. Schmidt, Professional Bldg.

Huntington
Frampton & Bowers, 412 11th St.

Welch
Hassell T. Hicks, McDowell County Bank Bldg.

Wheeling
Frederick Faris, 1117 Chapline St.
Edward Bates Franzheim, 1425 Chapline St.

Wisconsin

Amery
E. F. Klinger, Box 192

Boscobel
Joseph G. Durrant

Eau Claire
Howard M. Nelson, S. A. F. Bldg.
Carl Volkman, 122 Barstow St.

Fond du Lac
S. E. Barnes, 419 Western Ave.

Green Bay
Gordon Feldhausen, 1464 Elm St.
Foeller, Schober & Berners, 310 Pine St.
Geniesse & Connell, 226 N. Washington St.
Oppenhamer & Obel, 110 S. Washington St.

La Crosse
Boyum, Schubert & Sorenson, Hoeschler Bldg. (also in Winona, Minn.)
Parkinson & Dockendorff, Linker Bldg.

Madison
Balch & Lippert, 16 N. Carroll St.
Law, Law & Potter, 111 North Allen St.
Frank S. Moulton, 110 E. Washington St.
Roger C. Kirchhoff, State Capitol
Riley & Siberz, 24 E. Mifflin St.
Starck, Sheldon & Schneider, Inc., 8 S. Carroll St.
Edward Tough, Washington Bldg.

Manitowoc
Wm. J. & F. W. Raeuber, Savings Bank Bldg.

Marinette
Max Hanisch, Stephenson Bldg.

Marshfield
Gus. A. Krasin, 202½ S. Central Ave.

Milwaukee
E. Brielmaier & Sons Co., 735 N. Water St.
Brust & Brust, 135 W. Wells St.
Clas & Clas, Inc., C. C. Reynolds, Associated, 759 N. Milwaukee St.
Gerrit J. deGelleke—Harry W. Bogner, Associated, 152 W. Wisconsin Ave.
Ebling & Plunkett, 739 N. Broadway
Eschweiler & Eschweiler, 720 E. Mason St.
R. A. Messmer & Bro., 231 W. Wisconsin Ave.
Alfred H. Siewert, 2309 N. 36th St.
Guy E. Wiley, 2213 N. 34th St.

Oshkosh
Auler, Jensen & Brown, E. R. A. Bldg.

Racine
J. Mandor Matson, Baker Bldg.

Sheboygan
E. A. Stubenrauch, 809 N. 8th St.

Two Rivers
Sylvester Schmitt, Bank of Two Rivers Bldg.

Wauwautosa
Mark F. Pfaller, 8525 Ravenswood Circle

Wisconsin Rapids
A. F. Billmeyer & Son, 172 2nd St.

Wyoming

Cheyenne
William DuBois, 1810 Capitol Ave.
Frederick H. Porter, 211 W. 19th St.

Sheridan
C. Walter Wiberg, Edelman Bldg.

Alaska

Juneau
N. Lester Troast & Associates, Juneau & Anchorage Sts.

Hawaii

Honolulu
C. W. Dickey, Damon Bldg.
John Mason Young, Merchant and Bethel Sts.

Canada

Calgary, Alta.
W. A. Branton, Calgary School Board,

Halifax, N. S.
C. A. Fowler & Co., Capitol Bldg.
A. E. Priest, 428 Robie St.

Montreal, Que.
Featherstonhaugh & Durnford, St. Catherine St.

Quebec, Que.
Pierre Levesque, 115 St. John St.

Regina, Sask.
J. H. Puntin, 2059 Elphinstone St.
Van Egmond & Storey, McCallum Hill Bldg.

St. John, N. B.
H. Claire Mott, 13 Germain St.

Sherbrooke, Que.
Louis N. Audet, 32 Wellington St., N.

Toronto, Ont.
S. B. Coon & Son, 4 St. Thomas St.
Mathers & Haldenby, 96 Bloor St., W.

Wolfville, N. S.
Leslie R. Fairn

SECTION IV
OPERATION AND MAINTENANCE

THE ORGANIZATION FOR MAINTENANCE IN A MEDIUM-SIZE SCHOOL SYSTEM

By BEN B. HERR

Assistant Superintendent in Charge of Business Affairs, Lexington, Ky.

THE necessity of maintaining buildings, service systems and grounds in safe and serviceable condition at a reasonable cost is common to all school systems, regardless of size. There are certain recognized and general essentials of a successful program of school maintenance; for example, efficient planning, promptness in making repairs, proper supervision, adequate cost records, periodic inspections, attention to preventive maintenance, salvage of useful parts and materials. But in spite of common necessity and recognized general essentials of good practice, school systems are forced into widely divergent ways of handling their repairs and replacements.

We find one system spending 1.1 per cent of its budget for maintenance, while another in its population group spends 11 per cent. Practice is influenced by many factors, such as the size of the district and age, construction and use of buildings, and it is not possible for one maintenance set-up to fill the varying needs of many different districts.

A large district may require an elaborate and well-equipped organization giving full-time employment to a number of skilled craftsmen supervised by a trained superintendent of buildings and grounds. As the school system decreases in size and resources, the maintenance division may consist of only a small crew or even one employee, and the very small district will have the work done chiefly by janitors with occasional special assistance from outside mechanics and contractors.

The Versatile Maintenance Man Essential

The 1939 Educational Directory published by the Department of the Interior shows less than 200 cities of more than 50,000 population in the United States. There are many more medium-size than large school districts. In the medium-size school system it is often necessary to adopt a maintenance organization in which few if any employees are specialists, each one being called upon to do a greater variety of work than the employee in the larger districts. The maintenance program will probably be less continuous, and many jobs will be postponed until vacation months when the regular maintenance force is supplemented by janitors. Selection and training of janitors is of increased importance if they are to be used successfully in maintenance work. Versatile janitors are essential to the maintenance program.

Certain natural advantages are possible to the school district that operates its own maintenance division, such as elimination of profit and overhead, having workmen familiar with school property and needs, having men available for supervising the work of outside mechanics and contractors, securing some uniformity of repairs and supplies, and opportunities for the use of employees in other than maintenance work. Those of us who are working in medium-size systems should not be discouraged by lack of personnel and facilities in our efforts to approach the efficient maintenance of the large districts. The smaller the district, the easier it should be for the administrator to achieve an intimate knowledge of the school plant under his supervision. This applies as well to all other employees. We also have opportunities for the multiple use of men and equipment which are denied the larger systems. In the ease with which we can cut "red tape" we must, however, take care to avoid slipshod methods and poor workmanship, which always tend to increase costs.

The following table is included for the purpose of giving a very general idea of our local maintenance expenditures and problems. Specific purposes could be served only by a cost itemization too complicated for the scope of this article.

School	Average Annual Pupils in Membership	Approximate Annual Average Maintenance Expense (1931-37)	Annual Cost Per Pupil in Membership	Erection Date of Present Building	Arbitrary % to Indicate Present Condition of Building
Henry Clay High School	853	$1347.00	$1.58	1928	93%
Lexington Jr. High School	646	1065.00	1.65	1918	70%
Morton Jr. High School (1)	571	1009.00	1.77	1908	40%
Jefferson Davis School	601	726.00	1.21	1923	84%
Harrison School	455	700.00	1.54	1904	75%
Johnson School (2)	519	952.00	1.82	1890	30%
Maxwell School	458	1071.00	2.34	1904	70%
Arlington School	457	475.00	1.04	1935	96%
Lincoln School	336	835.00	2.50	1911	65%
Ashland School	464	760.00	1.67	1917	72%
Cassidy School (3)	166	28.00	.18	1935	99%
Dunbar High School	517	1117.00	2.16	1922	72%
Russell School	458	550.00	1.26	1890	57%
Constitution School	505	480.00	.95	1904	68%
Patterson-Carver School (Old) (New)	336	104.00	.31	1935	98%
Booker T. Washington	571	576.00	1.55	1917	70%
TOTALS	7681	$11795.00	$1.55		

(1) Replaced in 1938
(2) Very poorly designed. Replacement will be made in 1939
(3) Figures cover only two years

The story of Lexington's maintenance expenditures and problems is told in brief by an analysis of conditions affecting the sixteen schools

Lexington's Efficient Two-Man Repair Crew

Our organization for maintenance in Lexington is built around the services of one man who, in the course of over twenty years of school work, has acquired a wide range of skills and is better described as a school mechanic than as a handy man. One full-time helper for this mechanic completes our repair crew. During the school months they are able to perform a large part of the maintenance work, and at times both are used to replace janitors who become ill. When not actually making repairs, these men are used for inspections and for minor alterations and improvements that can be made while school is in session. Transportation, an important factor in the maintenance of widely scattered school buildings, is furnished by a light delivery truck which carries a useful assortment of tools and repair supplies. This truck is used on one day each week for the delivery of instruction supplies and other items to the various schools.

With the school mechanic, his helper and the repair truck, we attempt to carry out the functions of the "Flying Squadron" repair crew as described by the late George F. Womrath in his "Efficient Business Administration of Public Schools." Contact with the repair crew is kept by telephone reports to the business office from each job in order that emergencies may be promptly met.

The Aid of a Trained Janitorial Staff

In the vacation months the repair force is increased by assigning fourteen janitors to maintenance duty. We have tried to make up for lack of skilled workmen in two ways: first, by employing craftsmen if possible when vacancies occur in the janitorial staff; and, second, by assigning the same men year after year to the same type of work, and in so doing to give consideration to the interests and abilities of each individual. Besides encouraging the janitors to develop useful skills during school months, in each of the past three years we have sent several men to Minneapolis for the ten-day summer session of the custodians' training school. The all-expense cost of less than $45 per man appears to be more than justified by their increased efficiency, not only as janitors but also in maintenance work. In the combined maintenance and janitorial staff there are now some men with reasonable skill in plumbing, carpentry, painting, plastering and glazing. A teacher in a small trade school has become a licensed electrician and is available after school hours and during the summer months for electrical repairs. With the present force it is possible to make many minor alterations and improvements in addition to maintenance. A good tinner and roof-repair man added to the janitorial force will complete our service.

Planning and Organizing the Work

Planning is an essential part of any maintenance program, not only in order to get the most necessary things done, but also to avoid the waste of having men idle. About six weeks before the beginning of the summer vacation we begin to assemble, from memoranda, reports of principals and janitors, and from the results of the annual general maintenance inspection of the schools by the school mechanic and business manager, the data which form the basis of the summer campaign. Before contracting for materials and services, cost estimates must be checked against remaining budget balances. Approved projects are divided into a "must" list and a "desirable" list. Records of previous jobs are sometimes found helpful in estimating the cost of current projects.

Near the close of the school term a joint meeting of the maintenance and janitorial staffs is held at which the various jobs are discussed and the men assigned to work crews, each headed by a foreman.

Plans are made for furnishing each crew with the needed equipment and materials, and the crews assigned to outdoor work are given orders designating indoor jobs to which they are to report when their work is interrupted by unfavorable weather.

Repair operations which are necessary each year are handled as a matter of routine. Immediately after the close of school, each head janitor is expected to have his school heating plant cleaned, painted and ready for inspection by the school mechanic. A list of needed repairs is made up and the jobs are checked off as they are completed. Another routine operation is an annual reconditioning of plumbing in each building. Repair of all broken plaster is also a regularly recurring task. A record of paint jobs is kept, in the form of a schedule showing proposed painting for the following year. This schedule is helpful in preparing the maintenance budget and also aids in preventing neglect. No painting is done until inspection has shown it to be advisable. In our climate, outside painting becomes necessary in from three to five years. Inside paint is renewed after one or more washings in five to eight years. Use of relief labor for inside painting has made a substantial improvement in the condition and appearance of the schools in the past few years.

The Maintenance of Floors

Floor maintenance methods have been so greatly improved, and so much excellent information is now available on this universal school problem, that any school district should be able to work out a satisfactory practice for its various types of flooring. Two of our janitors have developed excellent skill in floor work. For the hardwood floors we have adopted a treatment of penetrating seal buffed with steel wool by an electric machine. This finish saves janitors' cleaning time and is very durable. Spots worn by heavy traffic can be re-treated without showing marks of overlapping, and the entire surface can be brought back to its original appearance by re-treatment with a less concentrated preparation of the seal every few years. While waxing once or twice a year would undoubtedly prolong the life of this finish, janitors' time is not available for making this a general practice. Softwood floors are a more difficult problem, and this year we have tried a finish intended for gymnasium floors which the High School at Richmond, Ky., has used with satisfactory results. This promises to be our most successful experiment in the treatment of old pine floors. An asphalt tile which can be laid for 15 cents per square foot has been an excellent improvement in basement classrooms with concrete floors in a few of the older buildings. Although this flooring is available in roll form, the squares make a more attractive surface. (See Fig. 1.) Its main disadvantage is that it is available in only a few colors, all of which are rather dark. Our equipment for floor maintenance includes a sander, an electric scrubber and polisher, and a steel-wool buffing machine. A disk type sander for finishing floors around the base molding is needed to complete the equipment. Few things add more to the appearance of a school than well-kept floors.

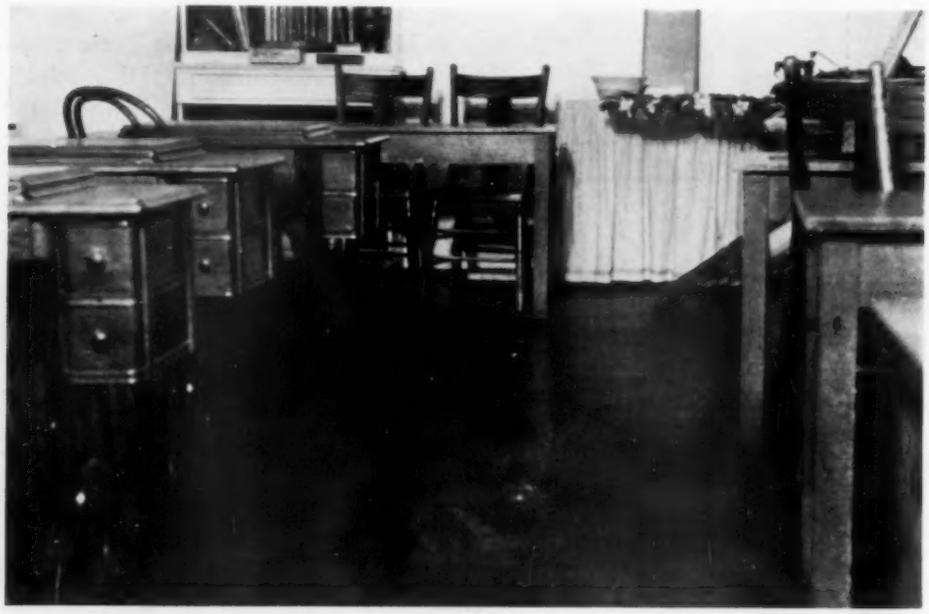


Fig. 1—An asphalt tile which can be laid for 15 cents per square foot is attractive as well as serviceable when laid over the concrete floors of old-fashioned basement classrooms

Special Improvements

In the course of the maintenance work we try not to overlook opportunities for making improvements

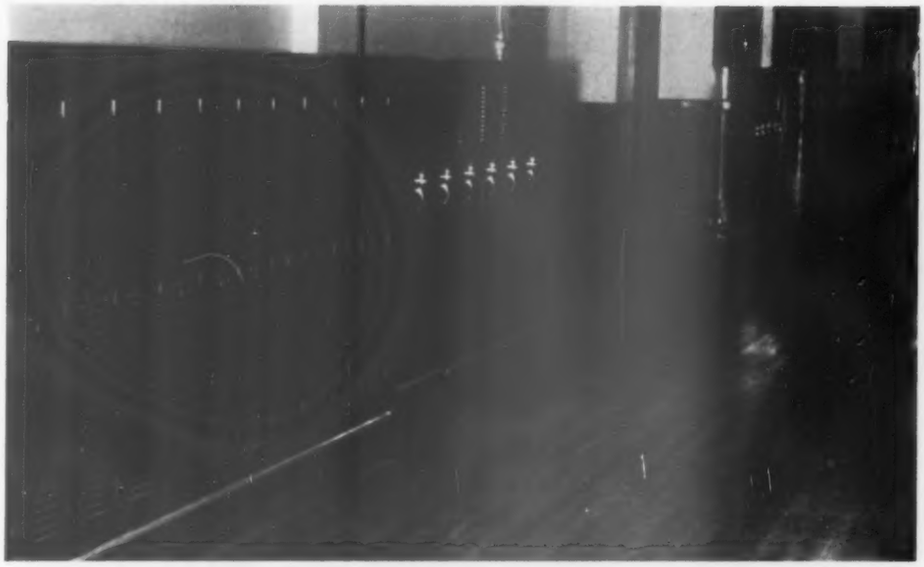


Fig. 2—A recently refinished corridor in an old building, showing the neat arrangement of lockers, set closely against the wall and flat on the floor

which will add to the usefulness and attractiveness of the plant, reduce costs or save time for teachers and janitors. Figure 2 shows a corridor in the junior high school, a building twenty years old. The pine floor has been sanded and refinished with the gymnasium seal just mentioned. The lockers were formerly mounted on legs, and the space underneath them was difficult to clean, and became a tempting receptacle for trash thrown by careless students. After experimenting with a small section by sawing off the legs, we developed the mounting shown. The lockers are set flat on the floor and held in place by an inexpensive quarter-round standard molding low enough to permit normal operation of the doors. No dirt can get under them, and the cleaning difficulty has disappeared. To allow them to be set closely against the wall, the baseboard was removed and refitted around the sections. As removal of the steel legs by hand was too slow to be economical, a contract was made with a local machine shop to cut them with an acetylene torch at a cost of about 6 cents per locker. The small damage to the finish by heat is concealed by the molding. The former locker arrangement is shown in the illustration of the corridor in another of the buildings of similar construction. (See Fig. 3.)

The Benefits of Fire Insurance

Fire damage may offer an opportunity for improvement rather than simple restoration, especially to the school system with a competent maintenance force. Figure 4 shows the interior of one of the older buildings after repair of damage by fire started deliberately or carelessly by vandals who broke into the school at night. Study of the itemized repair estimates, which were the basis of a $10,200 insurance settlement, led to the employment of an architect and the use of our own labor for some of the work.

Fig. 3—When mounted on legs, the lockers add to the cleaning problem. By cutting the legs off, that difficulty can be solved at a slight cost

In this way we were able to add fireproof stairwells at each end of the building, to surface corridors with heavy linoleum having a cove base border, and make many other improvements, all within the amount of the funds from the insurance settlement. This was made possible by careful planning, elimination of a general contractor's profit, competitive bids on materials, the ingenuity of the architect, and the ability of the repair crew.

The Framework of Economical Maintenance

In summing up our efforts to carry on an economical program of maintenance, the following are important: (1) prevention of major repairs by prompt attention to all small matters and providing for routine handling of recurring maintenance; (2) development of useful skills and interests among our own employees; (3) providing the best that we can afford in tools and equipment; (4) planning the replacement and repair program with a view to cost over a period of years rather than first cost; (5) use of expert advice and skilled craftsmen for jobs which are beyond the abilities of our own force.

The importance of maintenance work cannot be appreciated without reference to costs. Even in a system of this size over a ten-year period we spend, for maintenance, the price of a good fire-resistive elementary school building of fifteeen classrooms, complete with equipment. To prolong the useful life of the school plant through adequate maintenance increases the community's ability to provide for instruction.

Fig. 4—Fire insurance settlements may make it possible to improve rather than merely restore

SCHOOL PLANT INSPECTION

By C. L. CRAWFORD

Assistant Superintendent in Charge of Business, The Public Schools of the City of Muskegon, Muskegon, Mich.

THE school plant is built to serve a definite purpose in the educational scheme of today. School buildings and grounds provide the physical setting and housing in which we center our educational processes. In planning and designing the school plant the primary aim is to construct that which will contribute toward the educational processes which will assist in developing pupils into capable, useful and well-integrated members of society. A school plant which has no value in promoting the growth and development of pupils has no justification.

The Scope of Inspection

Suitable and adequate educational plant facilities can be operated and maintained. To do this, something more than casual routine must be established. To inspect, one must have a definite aim. There are several categories into which the scope of operation and maintenance inspection may be classified. A convenient division is as follows:

1. Roof, including gutter and cornice work
2. Walls, both interior and exterior, including doors and windows
3. Attic
4. Floors and foundations, including stairways
5. Stacks, towers, etc.
6. Heating and ventilating units
7. Electrical system
8. Plumbing, with special emphasis on toilet and shower units
9. Furniture, fixtures, equipment and instructional apparatus
10. Grounds, including walks, curbs, pavements, trees, etc.
11. Miscellaneous, including clock, telephone, signal systems, etc.
12. Operation and maintenance personnel, with special attention to dress and appearance

Purpose of Inspection

Our educational processes are under continual change. Since the school plant should play a vital part in the educational program, inspection must play a large part in securing proper maintenance and operation of the plant. In brief, one might state the purpose of inspection to be the promotion of the operation and maintenance of the school buildings, grounds and equipment in the most efficient manner possible as an aid to better education.

Promotes Efficiency of Personnel.—Any inspectional program if properly carried out should promote the efficiency of personnel. As yet there is little professional status for school operation and maintenance employees, especially custodial workers. Therefore, many new employees of this sort are selected from lists of applicants made up largely of unskilled laborers, and in-service training of some sort becomes necessary.

Inspection can assist in-service training for operation and maintenance employees through constructive criticism, suggestions and instruction. It should also locate and select new and better practices in maintenance and operation on the part of employees, which should be given recognition and be passed along to others of the staff.

Assists in Maintaining Proper Social Relationships.—An efficient system of inspection not only makes possible an increased understanding between employees and administrators of a school system, but also should assist in establishing and maintaining proper and friendly relationships between the school and the community.

Whenever an inspection for appraisal purposes is made by persons in authority, they should be accompanied by those whose work is being inspected. This will further better acquaintance among the individuals, and help prevent the suspicious and ill feeling that often results from the "spying" or "snooping" type of inspection.

Even most casual inspection from the ground will show that such a chimney condition should be remedied immediately

Community relationships may be maintained or improved by keeping attractive, clean, neat and well-maintained buildings and grounds. Landscaping and well-kept and attractive lawns will always be a source of civic pride. The absence of such nuisances and inconveniences as snow or rubbish on the walks, open pits, ditches, fallen trees, or water sprinklers set too near the sidewalk, may not be mentioned by passersby, yet carefulness with such items will pay large dividends over a period of time in the form of improved social relationships between school and community.

Assists in Increasing Operating Efficiency.—Operation efficiency can best result from a thorough knowledge of school plant in all its aspects. Changes can be made in many schools whereby increased educational efficiency can be brought about at no added cost, or present efficiency be maintained at less cost.

Many instances are on record where savings in electricity, water and fuel or other operation items have resulted when inspection brought a problem to light. One school with a pupil enrolment of 10,000 recently made changes in lighting, power and water usage which not only made possible an annual saving of over $2,000 per school year, but actually increased efficiency as well. This resulted from replacing obsolete toilet fixtures in several buildings, and from rearrangements in power units, switching control, and light fixtures. In one situation replacement of fixtures in a library reading room decreased the load from 8,200 to 5,600 watts, yet stepped the average illumination up from 8 to 37 foot-candles on the reading-table surfaces.

While it was necessary to expend approximately $4,000 for new materials in making these changes, the savings accomplished will more than equal the material cost by the end of the second year. In addition, increased operating efficiency and in most instances much better services are being rendered as a result of the changes.

Assists in Keeping Hazards at a Minimum.—Besides increasing operating efficiency, inspection can help to keep hazards at a minimum. Broken cornices, cracked chimneys, loosened stair treads or nosings, unsafe fire-escape landings, improperly adjusted safety valves, improper or irregular fusing of switch-boxes—all these and many more hazards to the physical safety and well-being of pupils and teachers may be avoided or corrected as a result of inspection.

Custodial and maintenance forces may become so familiar with their surroundings as to fail to recognize danger signals. At other times unusual care in observation will bring to light certain hazards. One such instance occurred where a small moisture leak

A close-up of a bad condition in an exterior brick wall which needs repointing. A bad chimney condition also exists

The area in this picture is over a window and had been covered by tin cornice work. Moisture had been seeping through the eaves trough above, and after a period of years the wooden joists, eaves trough supports, some of the brick work, and the stone lintel over the window showed extreme effects of decay and erosion. Only the most careful inspection will determine such conditions when covered with tin cornice

through the eaves trough of a building caused a stone lintel to erode gradually until no more than 7 inches of a former 12-inch thickness remained in the middle. Likewise, several of the 12-inch joists which extended from the building to support the cornice and gutter had deteriorated wholly or in part from effects of the combination of heat and moisture.

While this process of deterioration had no doubt been going on for years, it was very difficult to detect, because the tinwork of the cornice covered the wooden supports. When shattering of rock and falling of rock particles were noticed, the sheet metal was removed and the conditions described were found. The stone lintel had given way and begun to sag in the center. Its major support was the window sash below. Had inspection failed to find this hazard in time, the stone weighing several hundred pounds would have plunged down three stories to the ground below, landing within a foot or two of one of the exits from the school building.

Persons Concerned with Inspection

In the operation and maintenance of a school plant, the number of persons concerned with inspection will vary with the size of the system. The smaller the system, the fewer the persons concerned, and also the fewer the problems involved. In most systems, however, there is some one executive head upon whom the responsibility will devolve. The larger the system, the greater the possibility that the executive will delegate at least a portion of the work concerned with the control of operation and maintenance.

A superintendent of schools may delegate responsibilities for inspection to his assistant. The assistant in turn may expect cooperation from building principals, head custodians, city firemen, and insurance underwriters. The more individuals concerned with inspection, the better should be the operation and maintenance of the school plant. One person may be trained in inspecting for fire hazards, another for structural defects, and others may be on the lookout for increasing educational efficiency of vocational shops, the improvement of lighting, or the necessity for repainting walls.

Ultimate Goal of Inspection

In discussing the ultimate goal of inspection for the proper operation and maintenance of the school plant a long list of aims might be given. Properly heated and lighted classrooms, well-preserved buildings, safe stairways, fire-escapes and heating systems are all important objectives. The educational processes can be most effective if the safety, health, happiness, and physical surroundings of pupils and teachers are provided for in the best way possible.

The final aim, however, in preparing and maintaining an efficient school plant can be stated rather briefly. It should be to cause the school plant to serve in assisting the development of pupils to their fullest capacity so that they may become efficient and well-integrated members of American social life. Moneys expended for school plant, equipment and furnishings which will assist in attaining this purpose are expenditures well made.

ADEQUATE SCHOOL MAINTENANCE

By S. C. JOYNER

Assistant to Business Manager, Los Angeles City Schools, Los Angeles, Calif.

SCHOOL buildings, equipment, and grounds should be maintained as nearly in the original state of repairs as possible. This necessitates expenditures for both repairs and replacement.

False Economy

Inadequate maintenance is false economy. The need of an adequate maintenance program is frequently overlooked when the community is faced with the difficulty of raising sufficient funds to carry on the desired educational program—as in times of economic depression. The appropriation for maintenance is one of the first to be reduced. While it is true that repairs and replacements may be postponed for a year or two without serious harm or inconvenience, some of the proposed "economies" may easily be carried too far and eventually the taxpayers will be compelled to pay a big premium for neglecting repairs. For example, a small roof leak that could be repaired at a nominal cost, if taken care of promptly, may eventually damage plaster, painting, woodwork, or roof decking so that extensive repairs will be required later. Unpainted exterior woodwork, a leaky water pipe, a loose screw in a piece of equipment, or a loose door hinge, will eventually result in higher expenditures for repairs or replacements if these minor defects are not given proper attention. Again, a machine in a workshop may be out of order because some minor part is broken or in need of adjustment, and may remain idle, although urgently needed for instructional purposes. There is no economy in neglecting such repairs for the sake of temporarily saving a few dollars where it means the loss of valuable instructional services.

Any proposed economy in the maintenance program should be considered in the light of ultimate financial costs and immediate service, and not merely with respect to temporary reduction in the budget. A niggardly maintenance policy will be expensive in the long run, will result in inefficient service, increased depreciation, and a shortened life of the property. In other words, no real saving is effected when the building is inadequately maintained and the life of the structure is cut to 80 per cent of its normal length.

Depreciation of the School Plant

Every part of a school plant is continually depreciating. From the day in which a new building is accepted from the contractor, depreciation begins. Actually, it begins before the building has been completed, for every material is constantly undergoing that process. Likewise, every item of equipment continually depreciates. Nature does her work well, but she produces nothing that will last forever. Someone has said, "Everything is on an irresistible march to the junk heap," and "Dust is the inevitable end of everything." The school plant is no exception to this rule.

Causes.—Four factors cause depreciation of the school plant. The first, and probably the largest, is the wear and tear of usage; the second cause is physical decay; the third is obsolescence (resulting from constant usage or out-of-dateness); and the fourth is damage from accidents, such as wind, lightning, earthquake, or other causes.

Varying Rates of Depreciation.—Buildings and equipment are composed of a number of individual items or units with varying lives. Some of these items must of necessity be completely replaced one or more times before the useful economic life of the whole property has expired. Thus a building with an economic life of fifty years may have a composition roof with a life of twenty years, etc.

Depreciation of a plant and of its several parts does not proceed at the same rate, and varies according to the type of materials used in constructing the building and with the quality of workmanship. According to H. M. Schwartz, the parts of the building which deteriorate rapidly, and which need constant repair, are, in order of frequency, the following: bells, clocks, alarms, batteries, windows, boilers, paint, grounds, sash cords, wiring, door checks and stops, electric fixtures, roofs, doors, hinges, drains, locks, switchboards, stairways, fire escapes, feed lines, and toilet bowls.

Retarding Depreciation.—Depreciation cannot be eliminated, but much can be done to retard it. School officials can do two things to retard and decrease the depreciation of school property:

Teach pupils and other persons to have a respect for school property. In any campaign of this sort, it is important first to place the property in a "respectable" condition. It is much easier to get pupils to cooperate in keeping the school property in good condition, once it has been placed in such condition, provided, of course, they are given some guidance.

"They are not vandals born and bred, but a broken window glass, one mark on the wall, one paper wad, or a knife slash will tend to call forth others of their kind. Everyone is cognizant of the power of suggestion."

As a dilapidated building invites vandalism, it is wise to make repairs as soon as practical after the need for them has been discovered. There is another more important reason, however, why repairs should be made immediately, and that is that they can be made much more cheaply and easily than when they are postponed. "Just as the immediate repair of a dwelling house or automobile is a mark of a wise owner, so the timely repair of school property is another characteristic of an efficient school official."

Need for an Adequate Maintenance Program

Physical property must therefore be constantly kept in a good state of repair. Following are three good reasons:

1. *Safety and Liability.*—A defective machine in a workshop, a broken piece of playground equipment, a defective fire escape, a piece of loose coping or brickwork, a loose stair step, a defective boiler, a poorly insulated electrical device, are hazards that endanger the lives of the school occupants.

California school districts are liable for dangerous or defective conditions which are not immediately remedied after the attention of the school district has been called to this condition. These political subdivisions of the state are also liable for the negligent acts of the employees of the district.

2. *Service.*—As schools exist for service, it is important that the physical equipment be properly maintained so that efficient service may be rendered. A poor typewriter, a marred desk top, a defective heating system, or mutilated textbooks, may interfere with the educational progress of the pupil.

3. *Economy.*—A timely maintenance program is usually economical, efficient, and reasonable in cost. Repairs, therefore, must be made promptly by competent laborers under careful supervision at a cost that is consistent with the value of the services rendered.

Programming the Work

1. *Continuous Inspection*

Continuous inspection and regular maintenance result in a saving by preventing minor repairs from developing into major repairs.

As in most school districts, the Business Division of the Los Angeles City Schools has a continuous or systematic inspection of all school property. This inspection is often the means of discovering the need of repairs not made during the holidays which may cause the closing of school or handicap the educational program. The chief purpose, of course, is to discover emergency repairs that cannot be postponed until vacation periods.

Everything on the school site, including walks, fences, and playground apparatus, is inspected. Each nook and corner of every room and each item of furniture and equipment is carefully scrutinized. When the inspection has been made, the schedule of repairs is made for the year.

Examples of such inspection are as follows:

Electrical

(a) Inspect and check fire-alarm systems. Failure of a single unit to operate properly may cause loss of life and property.
(b) Inspect cables and safety locks on large, heavy, special lighting fixtures in auditoriums.
(c) Check all electrical services for overloading.
(d) Inspect and lubricate electrically operated machinery and equipment. Damage and fire are frequently the result of negligence in regard to this type of service.
(e) Check switchboards and panels continually.
(f) Inspect portable appliances to see that there is no dangerous temporary wiring that might cause a fire.

Shop Equipment

(a) Shop equipment of all kinds should be regularly checked to be sure that proper safety guards are installed as requested by the State Safety Commission.

Plumbing

(a) Drinking fountains should be inspected and adjusted often.
(b) Water heaters and gas lines require constant and careful inspection.
(c) Broken or loose plumbing fixtures should be found and repaired at once.

Playgrounds

(a) Faulty playground equipment and apparatus are the causes of many accidents. Regular inspection and repairs are a necessity.
(b) The same is true of playground surfaces. A continuous program is desirable and economical.
(c) Improperly trimmed and topped trees are always a hazard.
(d) Weeds are a constant eyesore and fire hazard.

Painting Exterior and Interior Surfaces

(a) Failure to protect wood and metal surfaces eventually makes necessary the replacement of shower partitions, wood sash, doors, etc.

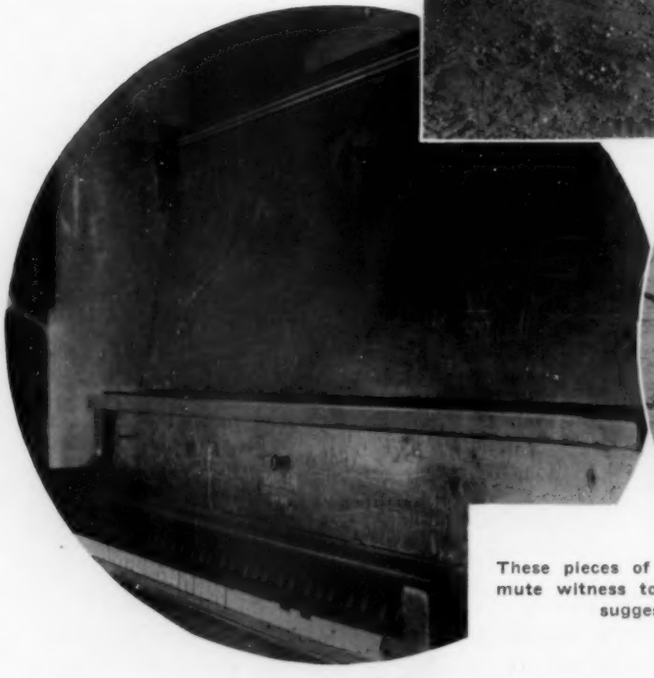
2. *Allocation of Expenditures According to Need*

With the information gained by this inspection service, it is possible to make an equitable distribu-

A poorly maintained sash lets in cold and rain

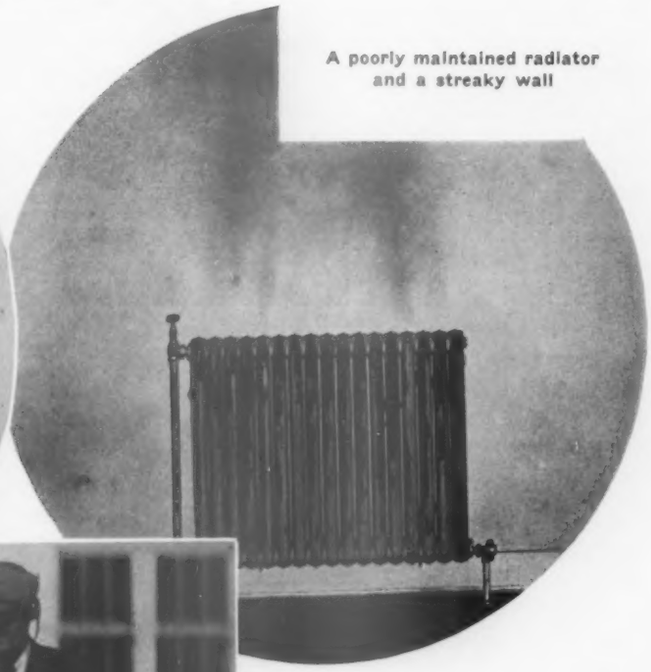
Poorly maintained steps are constant danger spots

Poor playground surfacing is likely to cause serious accidents



These pieces of furniture bear mute witness to the power of suggestion

It's poor painting policy to let wood decay!



A poorly maintained radiator and a streaky wall

This labor-saving device is useful in locating water lines and leaks

Termites can do a great deal of damage in a short while

tion of repair funds among the hundreds of buildings. Funds available for maintenance of school plants may thus be intelligently spent in the order of the urgency of need for repairs or replacement. Lists of jobs are then prepared for the various types of workmen.

3. *Supervision*

As proper supervision is one of the most important elements of a maintenance program, we have efficient men at the head to organize and direct the activities of the workmen. These head men, as supervisors and foremen, must be intelligent and have a knowledge of the various lines of work for which they are responsible. They are able to outline repair jobs so that the workmen may proceed without loss of time or effort. They are able to organize the working crews so that the different individuals perform the services for which they are best fitted. Good management does not tolerate waste in inefficiency. Supervisors and foremen, who are responsible for maintenance, should be capable of securing honest returns from their workmen.

4. *Proper Supply of Materials*

It is important that workmen be provided with necessary supplies and equipment so that their work will not be held up pending the delivery of needed materials. Jobs are analyzed and the needed supplies are delivered before or at the time the men start work. Where possible, small service trucks are furnished, and workmen carry with them a small stock of general supplies for minor repair items which recur frequently. Miscellaneous equipment and supplies are carried in the central warehouse, from which they can be secured promptly. When necessary, needed materials are ordered from the vendors, and prompt attention is given to their delivery.

5. *Labor-Saving Devices Aid to Economy*

As money permits, workmen are provided with good, modern tools and equipment in order that they may work speedily and efficiently. There are many labor-saving devices that quickly pay for themselves in time saved.

6. *Salvaging Materials and Equipment*

Considerable money has been saved in the past five years by salvaging parts of used or broken supplies and equipment and materials taken from demolished or rehabilitated buildings. The employees are directed and encouraged to use salvaged materials that may be used economically. For example, large pieces of broken glass may be cut down to usable sizes; parts of broken door-closers may be used in repairing other closers; desks and chairs that have been destroyed beyond repair may be dismantled and certain parts saved to repair other pieces of less badly damaged equipment; and window-shade rollers may be used again, even if the shade cloth must be replaced. The salvaging process is not carried to the point where it costs more in labor to make repairs using old materials than it would cost to make new replacements.

7. *Standardization*

So far as possible, we limit the different sizes of glasses in windows and doors, the number of types of locks in doors, panic bolts, door-closers, faucets, heating plants and appurtenances, roofs, and schoolroom equipment. With fewer types and sizes of materials and equipment, a smaller but more complete stock of repair parts can be kept on hand for prompt repairs. Workmen thus become more proficient because they do not have so many different types of jobs to perform.

Conclusion

School plants in the Los Angeles City School Districts involve expenditures of approximately one hundred million dollars in public monies. This property must be maintained in an efficient operative condition.

As custodian of this investment, we consider it the duty of the administration of the school system to set up sound maintenance policies that will guarantee maximum use and life of our properties.

THE LLOYD-THOMAS CO.

EXECUTIVE OFFICES

New York
350 Fifth Avenue

Chicago
4411 Ravenswood Avenue

DISTRICT OFFICES IN OTHER PRINCIPAL CITIES

The Lloyd-Thomas Co.

RECOGNIZED AUTHORITIES ON PHYSICAL VALUES

APPRAISAL ENGINEERS

APPRAISALS OF SCHOOL PROPERTIES

Lloyd-Thomas appraisals tell the school administrators exactly how much insurance to carry. They prevent wasted premiums resulting from over-insurance. They eliminate the hazard of under-insurance.

The administration of school property carries with it a responsibility of stewardship more serious than the administration of private property. The following item quoted from "The American School and University" emphasizes this:

"School boards are entrusted with the conservative and economical management of public property in which every member of the community is interested. Should this property be destroyed by fire or tornado, the loss must be recovered through insurance. Insurance to protect must be adequate, and of a sufficient sum in the event of a loss to reimburse for the actual cash value of the property destroyed. It is apparent, therefore, that before the proper amount of insurance can be provided, it is first necessary to determine the true value of the properties which are to be protected. A detailed appraisal will provide this protection, eliminating uncertainty and guesswork."

Accurate and competent valuation of a property made before the fire, answers the question of how much insurance should be carried. It also answers the question of how much can be recovered with justice both to the insured and the insurer. Self-interest disqualifies both as appraisers.

Disinterestedness or impartiality, however, are not the most essential qualities of an appraisal if it is to serve the many purposes intended. It must have behind it documentary proof of its accuracy—an authenticity gained not from personal opinion however reliable, but from recorded technical and economic data available for substantiation of the values established.

Cost and Price Analysis Division

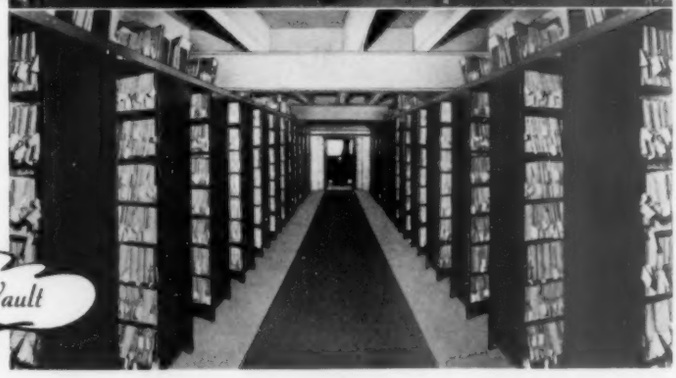
THE AMERICAN SCHOOL AND UNIVERSITY

BASIC CONCEPTS OF LLOYD-THOMAS SERVICE

The founders of The Lloyd-Thomas Company more than a quarter century ago envisioned both the need for authoritative appraisal service and certain fundamentals essential to such service if intended to serve a sound constructive purpose in our economic scheme of things, these fundamentals being:

1. That the personal opinion of no single individual should control in establishing the value of an important item of property.
2. That the making of a dependable appraisal should involve:
   (a) Examination of the property by technically competent men working under prescribed instructions and trained in technical description, identification, analysis and determination of physical condition and obsolescence factors and an inventory procedure.
   (b) Scientific application of cost analysis and depreciation data by a different personnel, to the descriptive inventory prepared by field examiners.
   (c) Summarization of the appraisal by still another personnel and in a manner to meet both standard and special requirements.
   (d) Certification of the total values determined by the appraisal, the resulting certificate having behind it such recognized high standards of practice as will compel its universal acceptance as an authentic document bearing the signature of a responsible institution.
3. That the appraisal organization should engage in no other activity which could conceivably affect its status as an independent agency concentrating on the one function of competent, impartial establishment and recording of property values.
4. That its organization, financial structure and responsibility should be such as will insure perpetuation of the institution, thus making its findings of today available for use one year or fifty years hence, if required.

Calculating and Typing Division



The Vault

SIGNIFICANT FACTS ABOUT THE LLOYD-THOMAS ORGANIZATION

The Lloyd-Thomas Company was founded in 1910 by men having the above concept of the ideal in appraisal service and in an appraisal institution.

Since that time more than 35,000 properties of practically all varieties and types, in all sections of the United States and Canada have been subjected to the organization's analysis and appraisal. Copies of all of these thousands of completed appraisal reports together with the original working notes and computations supporting the values established, are filed in the company's fireproof vaults.

Lloyd-Thomas appraisals have been used in adjustment of several hundred insured losses. The immediate availability of complete property records and authentic valuations simplified these adjustments to the point of practical elimination of controversy over equities.

The Lloyd-Thomas organization comprises approximately 200 persons qualified by education, training and experience to function in one of the following general divisions of the company's staff:

Appraisal Engineers
Cost and Price Analysts
Research and Library
Appraisal Maintenance
District Representatives
Auxiliary Office Personnel
Executive and Administrative

The company's headquarters building is located at 4411-15 Ravenswood Avenue, Chicago. It was specifically designed for appraisal usage. The original structure erected in 1923 was expanded by additions erected in 1925 and 1937. The floor space now occupied comprises approximately 25,000 square feet.

The physical equipment of the company's headquarters consists of the latest mechanical devices adaptable to appraisal procedure, comfort and health of personnel, and tending toward increases in efficiency, accuracy and speed of execution of the organization's work.

AVAILABILITY OF DISTRICT REPRESENTATIVES

Lloyd-Thomas service is made available to its clients through the company's District Representatives—men trained in designing the service best adapted to the specific requirements, property, business, or expected appraisal usage. Their knowledge of subjects related to insurance protection and property control, enables them to make constructive and responsible recommendations. District Representatives are permanently stationed in industrial centers throughout the country, making Lloyd-Thomas service readily available.

APPRAISAL MAINTENANCE SERVICE

An important feature of the company's activity is that conducted by its Appraisal Maintenance Division, rendering the service by means of which Lloyd-Thomas appraisals are maintained up to date at a nominal annual cost. More than sixty per cent of the company's clients take advantage of this service.

SCOPE OF LLOYD-THOMAS SERVICE

The experience of the Lloyd-Thomas staff and the scope of its statistical resources are such that practically every type of property is covered by its service —manufacturing properties of all classes including all types of industrial construction, machinery and equipment; commercial, residential, institutional and public buildings — hotels, apartment houses, stores, residences, schools, churches, hospitals, and other structures; furnishings, fixtures and equipment of all classes found in these properties.

APPRAISAL PROCEDURE

Our thoroughly experienced appraisal engineers working under prescribed instructions are sent to the property. They make (1) a complete analysis of the quantity, quality and condition of all items of building construction elements together with the necessary drawings and (2) a complete inventory and physical examination of all items of equipment to be included in the appraisal.

From our statistical resources on current prices adjusted to local conditions and on depreciation, for each logical division of building construction and for each item or classification of equipment, we determine and affix (1) the current **Cost to Replace New,** (2) the per cent of **Depreciation** evidenced by the age and condition of the property items, and (3) the **Insurable Value** in accordance with the accepted insurance interpretation of the term.

THE APPRAISAL REPORT

The data when assembled, compiled and summarized comprise our appraisal report. The report consists of a leather-bound volume in which is recorded the complete technical description of each item of property together with the cost and depreciation data described above. The report is summarized in harmony with the insurance segregations and coverage for the specific property as evidenced by the rider form attached to the policies covering it.

Except as otherwise requested, one copy of the report is furnished the client and a duplicate copy is preserved in our vault for use in case the original becomes lost or destroyed. All working papers and other data used in preparation of the report are also carefully preserved and are available if, as and when required.

COSTS OF LLOYD-THOMAS SERVICE

The relatively nominal charges for Lloyd-Thomas service are based on the character, ex-

COMMENTS OF SCHOOL ADMINISTRATORS

"The recent re-appraisal determined the fact we were carrying excess insurance principally on the new buildings which were constructed with Federal aid, and a saving of more than $2000.00 in insurance premiums has been effected through a lower appraised property value. The investment in your service will be offset by this saving. We recall our pleasant experience with your company in connection with the satisfactory loss adjustment of our Enos School. It determined the wisdom of having complete appraisal records available."
Board of Education, Springfield, Ill.

"The appraisal you recently prepared for us has met with universal approval. The information furnished therein gives us a feeling of security and the assurance that our values have been properly determined."
Proviso Township High School, Maywood, Ill.

"We were much impressed with the ability of the appraisers and the evident care taken even in small details to give us something which could be considered authoritative."
Oberlin College, Oberlin, Ohio

"We recently had a fire at our Kitzville School and with your records had no trouble in reaching a very satisfactory agreement. At this time we cannot say too much for the service you recently completed for us."
Independent School District, Hibbing, Minn.

"You may recall that we had no appraisal and were therefore more or less going blind on our insurance coverage. After receiving your report and knowing just where and what our valuations were we were enabled to increase our insurance coverage some $50,000, pay for your service and have left a substantial saving in our insurance account. We feel your appraisals are as necessary as insurance itself."
James Millikin University, Decatur, Ill.

"Previously we did not feel warranted in using co-insurance because of our lack of value knowledge. We have just recently had the appraisal brought up to date reflecting the present lower price levels. Our insurance has been reduced in accordance with the new values and substantial savings made."
Independent School District, Sioux City, Iowa

"We are now able to set up our fire and windstorm insurance program with accuracy and intelligence as compared to the guesswork scheme which we formerly pursued."
Board of Education, Wheaton, Ill.

"We want to express our hearty appreciation for your services in connection with the present loss by fire of our McKinley School. The Board feels that we are much indebted to you for the settlement which we were able to secure from the Insurance Companies."
Board of Education, Chicago Heights, Ill.

"We are very well pleased with your appraisal of our school buildings. This appraisal which makes it possible for us to write accurate 80% co-insurance on our buildings enables us to save about $1,000.00 a year on our insurance premiums over the old method we have used."
Public Schools of Wisconsin Rapids, Wis.

tent and location of the property to be appraised and the extent of detail required by the nature of the property or uses to which the appraisal is to be adapted. On request, and without charge, a Lloyd-Thomas District Representative will inspect a property, review the requirements for appraisal, and furnish an estimate of the cost for specific service.

The Lloyd-Thomas Company welcomes consultation or correspondence in respect to any problem which independent, impartial, sound and responsible appraisal service would assist in solving.

EDUCATIONAL INSTITUTIONS APPRAISED BY THE LLOYD-THOMAS CO.

District of Columbia
- Holy Cross Academy
- St. Cecilia's Academy

Illinois
- Grand Prairie Seminary and College—Onarga
- Lewis Institute—Chicago
- James Milliken University—Decatur
- North Central College—Naperville
- Presbyterian Theological Seminary—Chicago

Indiana
- St. Mary's of the Woods—Terre Haute

Minnesota
- St. John's University—Collegeville

Missouri
- Principia School—St. Louis
- School of Mines and Metallurgy—Rolla

North Dakota
- All state owned properties including:
  - Agricultural College
  - Normal Schools
  - School of Forestry
  - School of Science
  - Teachers' College
  - University

Ohio
- University of Akron
- John Carroll University—Cleveland
- University of Dayton
- Denison University—Granville
- Oberlin College
- St. Mary's of the Springs—Columbus
- St. Xavier University—Cincinnati
- Wilberforce University
- Wilmington College

Pennsylvania
- Sacred Heart Academy—Lancaster

Tennessee
- Castle Heights Military Academy

Texas
- St. Mary's Academy—Austin
- St. Mary's Academy—Marshall
- Texas Christian University—Fort Worth

Virginia
- St. Mary's Academy—Alexandria

Wisconsin
- Carroll College—Waukesha
- Northwestern College—Watertown
- St. Francis Seminary—St. Francis
- St. Johns Military Academy—Delafield

OUR CLIENTELE

PARTIAL LIST OF PUBLIC SCHOOL PROPERTIES APPRAISED BY THE LLOYD-THOMAS CO.

Illinois
Atwood, Casey, Chatsworth, Chicago Heights, Elgin, Evanston, Evansville, Freeport, Fulton, Galena, Geneseo, Harvard, LaGrange, Lake Forest, LaSalle, Loda, Maywood, Naperville, Onarga, Ottawa, Rochelle, Rock Island, Springfield, Sterling, Watseka, Waukegan, Wheaton, Woodstock

Indiana
Evansville, LaFayette, Plymouth, Terre Haute, Tippecanoe

Iowa
Algona, Ames, Atlantic, Burlington, Cedar Rapids, Elkader, Grinnell, Iowa City, Jesup, Mapleton, Mason City, Maynard, Newhall, Newton, Oelwein, Sac City, Sigourney, Sioux City, Sumner

Michigan
Battle Creek, Belding, Escanaba, Gladstone, Goodrich, Hastings, Ishpeming, Kalamazoo, Marquette, Muskegon, Newberry, Saugatuck, South Haven, Stephenson

Minnesota
Albert Lea, Austin, Brainerd, Canby, Chisholm, Dawson, Ely, Gilbert, Heron Lake, Hibbing, Lake City, Mankato

Minnesota—(Continued)
Marietta, Marshall, Mountain Iron, North Mankato, Osakis, Red Lake Falls, Rochester, Sleepy Eye, Springfield, Virginia, Wabasha

Missouri
St. Joseph

New Jersey
Bloomingdale

North Dakota
Langdon, Lisbon

Ohio
Cambridge, Chillicothe, Columbiana, Conneaut, Duncan Falls, Fostoria, Girard, Miamisburg, Philo, Wapakoneta, Warren, Zanesville

Pennsylvania
Brockway, Brookville, Burgettstown, Clarion, Coudersport, Ellwood City, Franklin, Greenville, Monaca, Philipsburg, Punxsutawney, Union City

South Dakota
Aberdeen

Tennessee
Shelby County (Memphis)

West Virginia
Huntington, Moundsville, Wheeling

Wisconsin
Durand, Kenosha, Marinette, Merrillan, Monroe, Neenah, New Holstein, Oconto, Pittsville, Portage, Reedsburg, Sauk City, Sturgeon Bay, Viroqua, Waterloo, Watertown, Waukesha, West Allis, Wisconsin Rapids

THE AMERICAN CRAYON COMPANY

Manufacturers of a Quality Line of Floor Finishes

Sandusky, Ohio

BRANCH OFFICES

New York, N. Y., 9 Rockefeller Plaza
San Francisco, Calif., 116 New Montgomery Street
Chicago, Merchandise Mart
Dallas, Tex., Santa Fe Building

• KAYSAN—THE PERFECT FINISH FOR EVERY HARD-SERVICE CONDITION

KAYSAN is manufactured by the makers of the first penetrating varnish developed for heavy-duty, hard-service floors. It is recommended without reservation for schools, stores, factories, offices, clubs, public buildings, apartment houses and similar types of buildings where floors receive excessive wear but must be attractive and in keeping with their surroundings.

quickly enough so second application can be put on about two hours after the first. In the case of a third application, this third application can also be put on about two hours after the second.

It is a very durable finish which does not water spot, crack or scale off, gather dirt like oil, scratch or mar, need wet scrubbing, nor increase the fire hazard.

It applies easily, seals the wood, prevents slipping, gives a lustrous finish and takes hard wear.

KAYSAN Has All These Remarkable Qualities

Brings out the full beauty of the grain to a remarkable degree.

Needs never be refinished, but can be repolished with one application of KAYSAN as often as wear requires.

Will not show laps but can be applied to traffic lanes without resanding and refinishing the entire floor.

Dries bone dry and may be polished by friction.

Withstands the hardest usage.

Easily cleaned—reduces maintenance to a minimum.

Reduces time and labor to minimum as it sets up

KAYSAN allows the wood to more nearly retain its natural wood appearance than any other finish.

Cost of Application

Its ease of application and minimum cost of maintenance, makes cost of finishing with KAYSAN very economical.

Covering Capacity

Under average conditions, 1 gallon of KAYSAN finishes on oak, approximately 300 square feet with three applications; on maple, 400 square feet with two applications.

OTHER OLD FAITHFUL FINISHES

• FILTITE—An excellent sealer for old cement and similar surfaces.

• KAY-BRITE WAX (dries with a shine without polishing) and KAY-WAX Paste Floor Waxes.

• TRAZATITE—A Terrazzo sealer and finish.

• OLD FAITHFUL PRODUCTS

Backed by 104 Years of Successful, Expert Manufacturing Experience

1835–1939

OLD FAITHFUL

Also Crayons, Water Colors, Pencils, Inks, Pastes, and other OLD FAITHFUL Products

• Reg. U. S. Pat. Off.

ASPHALT PRODUCTS CO., INC.

Concrete Protective Finishes and School Maintenance Supplies

Syracuse (Eastwood Sta.), N. Y.

To School Executives, Architects and Contractors, we fully guarantee the products listed below. They are outstanding products in their field and fully guaranteed to live up to all claims made for them.

CEMPRO
Concrete Paint

A tested, proved finish that is guaranteed to stop concrete dusting and to waterproof all interior concrete surfaces against the absorption of moisture. Cempro leaves a rich, lustrous and colorful finish that is long lasting.

In the face of any experiences you may have had with other concrete paints, we guarantee that Cempro will prove a highly satisfactory finish that will protect the concrete. It enters the pores and becomes a permanent part of the concrete. It is unaffected by alkalies and will not crack, flake or peel. May be washed with hose or mop, with strong soap or soap solutions.

Available in 9 attractive colors.

One gallon will cover 250 sq. feet of surface with two coats.

OILPROOF
Concrete Paint

A special Cempro formula that withstands the solvent effects of gasolines and oils. Its beautiful, colorful finish has resisted all generally accepted oilproofing tests. An ideal finish for machine shops, garages and wherever oil dripping or spraying is ruining floors and spoiling their finish. Applied with brush or spray.

Available in a range of colors.

SILVER SEAL
Ready Mixed Aluminum Paint

An exceptional ready mixed aluminum paint, made of finest quality pulverized aluminum bronze powder—of super leafing quality. The vehicle is an excellent modified phenolic—tung oil varnish.

Silver Seal is economical. It does not cake in the can, is readily mixed by shaking and always retains its brightness and leafing quality—no matter how often container is opened for use. Brighten up dark and dangerous halls, corners and rooms—and reduce lighting costs with ready mixed Silver Seal.

Silver Seal covers thoroughly. It is applied with a brush or spray and can be washed or hosed. It resists water, heat, acids, fumes and rust. While two coats are recommended, one Silver Seal coat has the hiding quality of several coats of ordinary paint.

DAIRY WHITE
Wall Paint

Dairy White Wall Paint is an unusual and ecomonical paint. Its first cost pays quick dividends because it eliminates the material and labor costs as well as the annoyance of quick repaint jobs usually required with ordinary paints.

Dairy White Wall Paint spreads easily, covers thoroughly and retains its color. Due to its moisture resisting characteristics, it is an ideal coating for all rooms where moisture and dampness are present. Applied with brush or spray. Has exceptional hiding quality. Will not chip, flake or peel.

One gallon will cover 450 sq. feet of wall with one coat.

HYDRO-PROOF MASTIC

For Floor Repair

Hydro Proof will repair broken and worn spots in any concrete, stone or brick floor. No special floor preparation is required and it takes only a short time to patch and repair. Worn stair treads, walks, cellar and storeroom floors are quickly and easily made smooth and safe with Hydro Proof.

Worn and broken floors can be resurfaced quickly and economically with Hydro Proof. This will give a quiet, waterproof, resilient and non-conducting floor that is easily cleaned with mop or hose.

Five gallons of Hydro Proof covers 45 sq. feet with a ½ inch thick surface.

An Old Broken Floor
Before and After Being
Repaired With Hydro Proof

For Waterproofing

Hydro Proof is an ideal waterproofing agent for concrete, concrete block or stone walls. It seals the pores and the voids in concrete and in mortar joints, eliminating dampness, preventing seepage and assuring protection against the deterioration of foundations and joints. It is also ideal for waterproofing roofs.

THE J. B. FORD COMPANY

Manufacturers of Wyandotte Products

Wyandotte, Michigan

BRANCH OFFICES AND SALES REPRESENTATIVES IN 88 NORTH AMERICAN CITIES

JOBBERS IN 630 CITIES AND TOWNS

Ask for free copy of our 64-page book "School and College Cleaning"

Here's What *Maintenance Cleaning Costs You* When Using WYANDOTTE DETERGENT

1 POUND CLEANS 507 SQUARE FEET

A single pound of Wyandotte Detergent at an average will leave 507 square feet of soiled painted surface looking like new.

And, too, the paint will still be there to wash many, many times again, the color of the paint will not be faded, nor will there be a yellowish tinge to washed areas of white paint. Washing walls with Wyandotte Detergent increases illumination from 20 to 40 per cent as has been proved by sight meter readings made by impartial lighting engineers in different cities.

312 TIMES FOR ONE DOLLAR

For less than one dollar you can mop a hundred square feet of flooring six nights a week for 52 weeks with Wyandotte Detergent. This means that 312 times a year, a space ten feet by ten feet can be mopped with Wyandotte Detergent for less than one hundred cents. It's odd, isn't it, that Wyandotte Detergent should ever be considered expensive?

And, too, Wyandotte Detergent "picks up" quickly and easily, it leaves mopped areas free from slippery films, it does not stain or yellow floors. In addition, mops last longer when Wyandotte Detergent is used. This has been definitely proved.

1 POUND CLEANS 230 WASHBOWLS

One pound of Wyandotte Detergent will clean 230 of the dirtiest washbowls you can find so that they look like new.

This means 24 washbowls can be cleaned twice a day, six days a week, for one year with the contents of one 75 lb. drum of Wyandotte Detergent and there will be enough Detergent left in the drum at the end of the year to wash over 5,000 square feet of soiled painted walls and ceilings. Yes, 5,000 is right, not five hundred. . . . And too, washbowls cleaned with Wyandotte Detergent are free from scratches, scars, or dull spots. Metal fixtures are polished as the washbowl is cleaned. In addition, and prove this for yourself, washbowls cleaned with Wyandotte Detergent stay clean longer than washbowls cleaned by other methods.

SEVEN CENTS PER SQUARE FOOT

Where marble is already stained or discolored, and even though such discoloration should be of many years' standing, the marble can be restored to its original beauty and color. Use Wyandotte Detergent as a poultice at an average cost of seven cents per square foot of poulticed marble. This figure **includes** labor.

And, too, the marble poulticing can be done with your regular maintenance force. Neither costly equipment nor expensive labor is necessary when restoring soiled marble to its original beauty with Wyandotte Detergent. The cost of keeping marble looking like new is very low if it is regularly washed with Wyandotte Detergent.

THE HILLYARD SALES COMPANY

BRANCHES IN PRINCIPAL CITIES — St. Joseph Missouri — DISTRIBUTORS FOR HILLYARD CHEMICAL CO.

A National Maintenance Organization . . . Over Thirty Years Continuous Service

To protect our customers against imitations all Hillyard products are registered and trademarked and shipped in sealed, checker board designed containers

Super SHINE-ALL Trade-Mark Reg. is not a soap, but a Neutral Liquid Chemical Cleaner for all types of floors, also painted and varnished surfaces. It possesses 100% active cleaning units. SUPER SHINE-ALL cleans, polishes, and preserves in one operation, requiring no rinsing. Saves time and labor. Officially endorsed by leading floor manufacturers. The one cleaning material that is qualified for safe use on every description of floor or wall surface.

HIL-BRITE Trade-Mark Reg. Self-Polishing Water Emulsion Wax, dries bright without rubbing or polishing, with a hard traffic resisting finish, yet has that soft lustrous glow of polished wax. It saves time and labor, cuts your waxing and cleaning costs in half. Endorsed by National floor manufacturers.

ONEX-SEAL Trade-Mark Reg. gives positive protection and restores the original attractive finish to Terrazzo, Tile and Cement. Tests proved ONEX-SEAL capable of withstanding the most severe weather and traffic conditions. ONEX-SEAL produces a waterproof, weatherproof, dust resistant, sealed polished surface. Nationally recommended by flooring contractors and manufacturers.

TERRAZZINE Trade-Mark Reg. excels for thorough curing and sealing of new Terrazzo. Approved by the National Terrazzo and Mosaic Ass'n., and selected by them to treat the Century of Progress display: —"The Cascades of the Months." Economical and simple to apply.

PINE-O-CIDE is an amber colored germicide, antiseptic and disinfectant made from pure Steam Double Distilled White Pine Oil, the highest grade possible to procure. It is soluble and forms a beautiful milk white solution in water. PINE-O-CIDE has a high phenol coefficient and serves efficiently as a fragrant antiseptic, nonirritating and non-corrosive. The fragrant pine odor makes PINE-O-CIDE a very effective deodorant for use in public buildings and institutions.

HIL-GLO FINISH Trade-Mark Reg. is especially designed to serve on Class Room and Gymnasium floors. Universally used for the reclamation and preservation of wood floors in all types of buildings. HIL-GLO FINISH is supreme for wearing quality, is non-skid and does not easily rubber burn.

DIAMOND FINISH Trade-Mark Reg. produces a brilliant, long wearing surface, easy to apply with brush or mop. Quick drying and especially adapted for wood floors.

PENETRATING SEAL NO. 21. The purpose of Penetrating Seal is to SEAL the fibre against penetration of moisture, thus reducing warping, to seal against penetration of dirt, ink stains and moisture, to preserve the natural color of the floor, and provide a more permanent finish that is both beautiful and economical, to reduce maintenance costs.

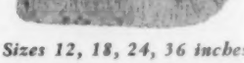
Penetrating Seal No. 21 and Hilbrite Self Polishing Wax is the ideal treatment for floors of class rooms, corridors, assembly halls, etc. This treatment preserves the natural color of the wood, is easily and economically maintained, and produces a durable and attractive finish.

HIL-TONE. Hil-Tone removes rubber burns and other marks from wood floors. It not only removes the marks easily when properly used, but also seals and protects the wood itself. The wood retains its light color and does not become oily or greasy as when ordinary dressings are used.

The seven story home of Hillyard Hi-Quality Products

WINDO-CLEAN, This lightning cleaner dissolves grime and removes dirt. No effort. No mess. No hard work. Eliminates buckets, sponges, water, squeegees and chamois, and makes glass sparkle.

DUSTLESS SWEEPING BRUSH leaves a clean lustrous surface, absorbs the dust, saves labor. The wicks are detachable and washable.



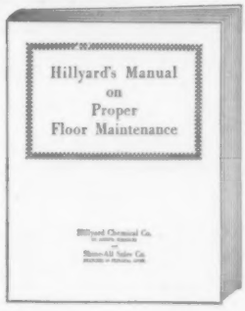
Sizes 12, 18, 24, 36 inches

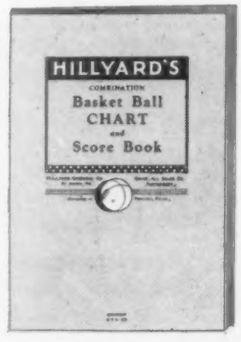
HILLYARD SALES COMPANY

...DISTRIBUTORS HILLYARD CHEMICAL CO. ... ST. JOSEPH, MO. ... BRANCHES IN PRINCIPAL CITIES...

FREE — THREE VALUABLE BOOKS

These three books full of valuable information, just off the press and compiled by the Hillyard Chemical Co. at considerable expense, are for you . . . absolutely FREE. Just another proof that the Hillyard Chemical Co. is the leader in the field of Sanitation and Modern Floor Maintenance.





SUPER-SPECIAL GYM FINISH produces a non-slippery, durable and sanitary floor, easy to maintain. Withstands hard and constant wear, gives proper reflection of light eliminating eye strain, insures a perfect non-slippery surface which will not rubber burn. Nationally used by leading Schools, Universities and Athletic Clubs, Private and Public Institutions.

HILLYARD'S WOOD PRIMER definitely seals and preserves, insures an ideal surface for the application of any desired finish or treatment. Universally used for the reclamation and preservation of wood floors in all types of buildings.

RENOVATOR. Hopelessly black and gummy floors can be brought out to look like new with Hillyard's Renovator. Oil-soaked wood floors can be scrubbed and bleached to a light color. The extra power in Renovator makes the toughest job easy.

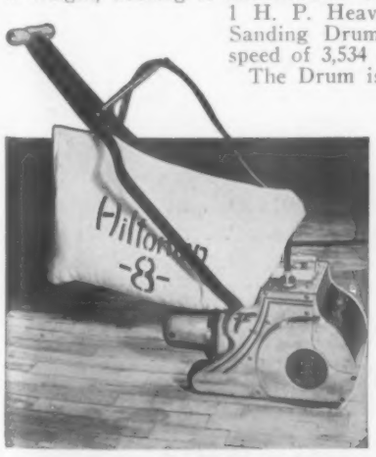
HAND SOAP. Velva-San is shipped in concentrated form, insuring the customer of 100 per cent value in every gallon. Although usually shipped and prepared in its natural state, Velva-San may be had in various colors and perfumes. Velva-San provides individual hygiene used in our dispensers. It is a forward step toward eliminating sickness and disease spread by unsanitary bar soap.

VICTOR SOAP DISPENSER. Built substantially, can always be depended upon to operate perfectly. Made of genuine brass parts, chromium plated. No springs to get out of adjustment, its use insures against waste of soap through dripping. Has universal ball-bearing valve. In case of breakage, any one of the three separate and distinct parts can be replaced at one-third the cost of a new Victor.

HILTONIAN "8" Floor Sanding Machine. With its ease of operation and handling, the Hiltonian "8" stands alone in the field of high production sanders. Although light in weight, nothing is sacrificed in cutting efficiency, as the 1 H. P. Heavy Duty Motor, 8-inch Sanding Drum travels at a surface speed of 3,534 feet per minute.

The Drum is dynamically balanced and with the "Hiltonian" improved spiral wrap of sandpaper, the quality of work cannot be surpassed.

Speed combined with light weight has long been desired by Educational, Public and Private Institutions.



HI-KO. Hi-Ko, a sodium hypochlorite solution, has an extremely high phenol coefficient. A couple of ounces to large quantities of water kills germs. Athlete's Foot — a disease caused by the germ (tinea trichophyton), invades every locker and shower room. Hi-Ko kills this germ. Use it to free infected floors.

Adding 12 ounces of HI-KO to the water in the tray will prevent "Athlete's Foot." The tray should be placed so that each person must walk through the solution when entering or leaving the pool or showers.

NEW "STEEL-TONIAN" STEEL WOOL MACHINE. Many flooring manufacturers recommend dry cleaning. For real economy and satisfaction use Hillyard's Floor Seals with the Hillyard "Steel-tonian";—the perfect steel wool machine.

The frame of the "Steel-tonian" is made of electrically welded steel plate. The only Steel Wool machine that contains a built-in dust collector. It is modern in every respect.

HILTONIAN SCRUBBING AND WAXING MACHINES. Hiltonian Electric Scrubbing and Waxing Machines are sturdily built and quietly operated. It takes but little effort to operate any of these four machines, due to their perfect balance. These machines co-ordinate speed, power and weight to give the utmost in all around service.

A Brush for Every Need. Brushes that are available include Blassine, Tampico, Palmetto, Fibre, Steel Wool and Wire. There are also attachment plates to which sandpaper or burnishing pads can be easily fastened.

Lowboy "Sixteen" 16 Inch

Master Lowboy 21 Inch

HILLYARD—"The Buy-Word for Maintenance Quality Since 1907"

J. I. HOLCOMB MFG. COMPANY

Indianapolis, Indiana

New York San Francisco

"Cleaning Headquarters"

Holcomb School SWEEPERS

Built to Specifications of Men Who Use Them

Holcomb manufactured floor brushes are known throughout the nation's schools for the FAST, thorough sweeping job they do. There's a reason for this. They were designed for and tested on the job by the men who USE them. There is a correct Holcomb tool for every cleaning job—a brush for every floor surface. **SPEED-UP** your cleaning job . . . CUT DOWN your maintenance time . . . make a **NEW PROFIT** for your institution on the labor saved with Holcomb tools. They are built to do a GOOD job—**FASTER!**

The PEKIN—for 30 years the School Leader.
The MEMPHIS—for Medium and Medium Rough.
The MASTER—for Smooth and Medium Floors.
The UNIVERSAL—All Surfaces.
The MIAMI (Illustrated)—Smooth, Tile, etc.
The CANTON—Smooth and Medium Floors.
The BOSS—for Rough Floors, Cement, etc.

All in 12-14-16-18-24" Blocks

Holcomb Floor Brushes reached "tops" in sales to schools of the nation two decades ago and has maintained this position ever since

Built to do a *Good* Job--*FASTER!*

. . . and the usual solution costs only "a Penny a Pail"?

PURITINE

Holcomb's Non-Caustic Dirt and Grease Solvent

There is **one** cleaner for every school cleaning problem . . . PURITINE. Because it's 100% active and 100% soluble, Puritine goes 3 times as far as ordinary cleaning powders. Remove gummy oil and dirt from floors . . . leave a slip-proof floor in halls and cafeteria . . . make grimy, ink stained desks and furniture come clean with Puritine . . . **economically.** Blackboards . . . painted walls . . . glassware . . . all are cleaned safely, surely, swiftly with Puritine. It's a maintenance assistant you can't afford to miss!

325 Lb. Bbls.; 150 Lb. ½ Bbls.; 100-50-25 Lb. Pails

SCHOOL CLEANING ITEMS WHICH "SPEED CLEANING TIME"

NO. 414 DUSTLESS SWEEPER
VITALIZED CLEANING COMPOUND
BUCKSKIN FLOOR DRESSING
HOLCOMB'S GYM FINISH
FLOOR MOPS
SODIUM HYPOCHLORITE

J. I. HOLCOMB MFG. CO. INDIANAPOLIS, INDIANA

Holcomb

WATER-PROOF WAX...

In school halls and classrooms where wet feet track over floors and dripping umbrellas stand in cloakrooms, the ordinary self-polishing wax can't stand the gaff . . . it water spots. Treat floors with Holcomb's Self-Polishing Water-Proof Wax to eliminate this reoccurring, needless expense. Water-Proof Wax will not water spot . . . flows on . . . can be walked on in 20 minutes. 4 to 8 hours after application it can be mopped wet without losing its luster. Brilliant and self-polishing, it saves labor time . . . **delivers a new profit to you each season.**

Shipped in 55-30-15-5 Gallon Drums

From 4 to 8 Hours After Application It Will Be Hardened Enough for This Test. Splash Water On It. Rub Water In With Your Hands.
Wipe Off Water. There Will Be No White Spots and Best of All . . . Its Brilliancy Is FULLY Retained!

"TEST IT YOURSELF!"

3000 Sq. Ft. of Perfect Floor Protection Per Gallon?

Holcomb's

SEAL COAT

Seal Coat forms a new 1/32 inch hard, protecting tread by penetrating and combining with the wood . . . does not build up above the floor. You must wear off the wood to wear off Seal Coat! One gallon of Holcomb's concentrated Seal Coat plus one gallon of turpentine covers and seals 1000 to 1600 sq. ft. of floor. One Seal Coat conditioning keeps floors like new for years to come . . . saving maintenance cost and time. An hour a day saved in floor maintenance time gives **you** a new profit of about $100.00 a year! (Labor at 40¢ an hour.)

It Penetrates!

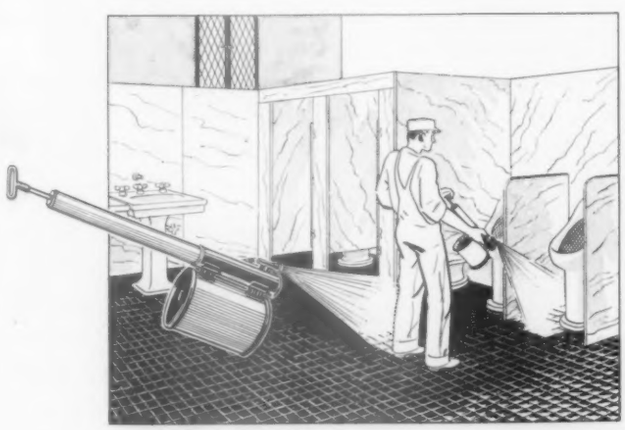
Shipped in 55-30-15 and 5 Gallon Drums

Holcomb's

FORM-AL SPRAY

An effective disinfectant that deodorizes and adds a mild, pleasant aroma . . . economical to use—that's Holcomb's Form-Al Spray. Many State Boards of Health recommend formaldehyde disinfecting for Schools, Institutions and Universities because it really disinfects and deodorizes. Holcomb's Form-Al Spray is a formaldehyde disinfectant plus a pleasing perfume . . . has 43.7% ACTIVE ingredients. Easy to use, it has proved invaluable for disinfecting and deodorizing desks, blackboards, lavatories, sinks, drains and rooms . . . also cots in fresh-air schools and dormitories.

In 55-30-15-5 Gallon Drums



HOLCOMB "BUILT-FOR-THE-JOB" CLEANING CHEMICALS AND TOOLS

VEG-OIL SOAP CLEANSER
LIQUID WINDOW CLEANER
TILE, TERRAZZO AND PORCELAIN CLEANER
NO. 6 TOILET BRUSH
FRESHETTES
CAGED ODOR BLOCKS

J. I. HOLCOMB MFG. CO. INDIANAPOLIS, INDIANA

THE SELIG COMPANY, INC.

DALLAS ATLANTA NEW ORLEANS

Manufacturers of

Disinfectants — Insecticides — Sanitary Supplies

ESTABLISHED 1896

Library, Agnes Scott College, Decatur, Ga.
Asphalt Tile Floor finished with O-Brite-O

O-BRITE-O

Those desiring a really fine self-polishing wax will find O-Brite-O to be above the usual. O-Brite-O really dries with a shine. Because of its unusually high content of the finest number one pure Carnauba wax unadulterated by cheaper, inferior soft waxes; O-Brite-O, when dry, leaves a hard resilient long wearing surface. It is easily maintained and not only wears well but looks well. A trial will certainly convince you. O-BRITE-O IS SAFE TO USE ON ANY TYPE OF FLOOR.

VARNAWAX

A high grade wax of strictly number one pure refined Carnauba wax combined with certain varnish gums in an oil solvent vehicle. Varnawax produces a hard resilient, water proof surface that looks well and wears well. Varnawax requires polishing and may be used on all floors except asphalt and rubber or other floors harmed by an oil solvent.

SCRUBZOL

A strictly neutral linseed oil cleanser especially developed and approved for cleaning Wood, Linoleum, Cork, Asphalt Tile, Marble, Terrazzo, Travertine, Magnesite, Masonite and other similar floors. Scrubzol is a concentrated product thus permitting a little to go a long way and do a big job—satisfactorily and economically. Don't take our word for it. Try it and prove it to your own satisfaction.

VARNASEAL

You'll find the answer to your Terrazzo and Travertine problems in Varnaseal. Seal these floors against the entrance of dirt, grease, oil, stains and foreign matter with Varnaseal. It is easy to apply, makes maintenance easier and gives your Terrazzo or Travertine the kind of protection needed. Lower your maintenance costs with Varnaseal.

WRITE FOR OUR FREE 1939 FLOOR MANUAL

Below: Gymnasium, Lee Edwards School, Asheville, N. C.
Finished with Selig's JIM KOTE

JIM KOTE

A mighty fine, chemically balanced bakelite and tung oil gymnasium finish. Does not rubber burn, impervious to alkali, salt water, alcohol and common acids. Easily maintained. Plenty of traction. An ideal finish. Our numerous satisfied customers are, we believe, the best judges. Their complete satisfaction makes us believe you also will be pleased. Jim Kote is easily applied by the mopping method.

FLOR-O-SEAL

Especially developed for classroom use. This penetrating seal, when properly applied, does not leave a surface film. Thus, Flor-O-Seal does not show unsightly traffic lanes. It wears well, is easily maintained and is economical. The application is very easy and simple.

FLOOR MAINTENANCE SERVICE

The SELIG trained and experienced floor maintenance engineers are qualified to assist you in any problem of scientific floor finishing and maintenance. They will gladly assist you in setting up the proper and most economical schedule of maintenance. Please discuss your problems with us freely.

We manufacture a complete line of floor maintenance materials and equipment. Our various materials have been approved by the leading makers of flooring materials such as Wood, Linoleum, Cork, Rubber and Asphalt Tile, Marble, Terrazzo, Magnesite, Masonite, etc.

DISINFECTANTS — INSECTICIDES — LIQUID TOILET SOAPS

In addition to the famous line of floor materials, the name SELIG has been synonymous with the highest standards of Disinfectants, Insecticides, Liquid Toilet Soaps and Sanitary Supplies for over forty years.

Put your problems up to us and permit us to offer suggestions and advice. There's no obligation involved and it may be of mutual benefit. Write for our big free complete catalogue.

THE SELIG COMPANY, INC.

DALLAS ATLANTA NEW ORLEANS

Manufacturers of

Floor Finishes — Waxes — Cleansers — Polishes

ESTABLISHED 1896

MIDLAND
CHEMICAL LABORATORIES, Inc.

Dubuque, Iowa, U. S. A.

The decided trend toward more attractive floors in educational buildings has led to the founding of many companies producing varied types of floor treatments. The resulting competition in some cases brought about a reduction in quality in order to compete by prices alone. However, the Midland has proven, through more than a third of a century of experience, that quality products are the most economical in the long run. Our Research Laboratory is constantly experimenting with processes that will reduce price without decreasing quality. You may specify Midland Products with the assurance of high quality—satisfaction and service.

Our Midland Maintenance Service Division is ready and willing to help you on any problems of maintenance—there is no cost or obligation.

Midland
MAINTENANCE
SERVICE

THE SYMBOL OF
MIDLAND Simplified MAINTENANCE

The correct use of the proper maintenance materials can oftentimes eliminate much of the time and labor usually spent in regular school maintenance. A Midland Maintenance Service Representative will gladly, at your request, call and explain MIDLAND Simplified Maintenance which will demonstrate the possibilities of reducing your maintenance costs. This service is offered without cost or obligation. Write Midland Chemical Laboratories, Dubuque, Iowa.

FLOOR PRODUCTS

MIDLAND LOHSEAL

Use—On wood, composition, linoleum, cork, masonite and concrete.

Description—Effective, practically colorless, pore and fibre seal. Applied with either lambs wool or felt mop. Excellent as a seal or a base for a wax treatment. It dries within a few hours.

Coverage—Wood: 400 sq. ft. per gallon, two coats.

MIDLAND GYMLOH

Use—On wood, or composition gymnasium floors.

Description—A special treatment for gymnasium floors containing a high percentage of Bakelite and tung (chinawood) oil. Acts as both a seal and finish. Gymloh is non-slippery and affords wonderful traction, will not hold rubber-burns. This finish will not peel, craze, alligator or flake and is very resistant to heat, alkali, alcohol, dilute acids, boiling water and stands excessive use. Dries to a beautiful lustre which does not darken light colored floors.

Coverage—Wood: 600 sq. ft. per gallon, one coat; 350 sq. ft. per gallon, two coats.

MIDLAND MID-CEDAR DUST LAYER

Use—For mop sweeping any type of floor.

Description—A volatile, non-slippery, non-greasy, non-sticky, cedar oil preparation which is not injurious to floor finishes. To be used with the dry mop method. It polishes, cleans and picks up dust quickly and efficiently.

MIDLAND EV-R-GLO WAX

Use—For waxing and maintaining wood, linoleum, rubber, terrazzo, composition, asphalt tile and other types of modern flooring.

Description—A water emulsion wax which, when dry, resists water, thus eliminating unsightly water spots. Dries with a polish—does not require buffing—easily applied with a lambs wool applicator—very economical, since the wax film is not affected or removed by water mopping—made with the highest grade No. 1 N C Carnauba Wax.

Coverage—1000 to 3000 sq. ft. per gallon, one coat, depending on the type of flooring.

TILEOLEUM (LIQUID AND POWDER)

Use—Excellent for cleaning tile, marble, terrazzo, slate, concrete and composition floors. Not recommended for use on rubber floors.

Description—There are three types of Tileoleum:

Tileoleum Sassafras, a mild liquid with powerful cleansing action, scented with sassafras.

Tileoleum Pine, a liquid cleanser for use in making stock scrubbing solutions. It contains pine oil.

Tileoleum Powder, a finely granulated, powerful preparation for use in removing rust, paint and metal stains from Tile, Terrazzo and Marble floors and walls.

Midland Tileoleums will not attack or affect the bond or tone of delicate, colorful installations.

MIDLAND FLOORGLOH WAX

Use—On practically all types of floors with the exception of rubber or asphalt.

Description—A white soft paste wax of the buffing type. Produces a hard lustrous and durable protective coating. Easily applied with a lambs wool mop.

MIDLAND MID-WAX

Use—For waxing and maintaining modern floors—not recommended for rubber or asphalt.

Description—A non-skid, non-explosive paste floor wax which can be polished to a beautiful lustre. Easy to apply—easy to clean—durable—economical.

MIDLAND MID-SEAL

Use—On marble, terrazzo, unglazed tile, slate and similar flooring materials.

Several treatments will eliminate the dusting of concrete floors.

Description—A seal and waterproofer which protects the flooring from daily traffic. Polishes to an attractive luster.

Coverage—Terrazzo: 800 sq. ft. per gallon, one coat.

MIDLAND CLEANSOLEUM

Use—On practically every type of modern flooring, especially adapted for linoleum and cork floors.

Description—A neutral cleansing compound which contains no acids. The action is not a burning but rather a dissolving and tearing down of soil deposit; the surface and body of the floor is not attacked in any way.

MIDLAND SUNSHINE PRODUCTS

MIDLAND SHILOH

This product fills a positive requirement in school maintenance. Shiloh properly cleans enamel, porcelain and like surfaces without injury.

It contains an extremely fine abrasive, a solvent for grease and oil accumulations and a chemical to remove the embedded soil.

MIDLAND FLUSHOLEUM

Midland Flusholeum (Liquid or Powder) has only one use, the cleaning of toilet bowls.

Midland Flusholeum is not injurious to vitreous chinaware and will not remove the glossy surface of this material. Both the Liquid or Powder will give satisfactory results.

MIDLAND MILL-O-CIDE

The Food Insecticide—effective against roaches, silverfish and other insects which occasionally infest school cafeterias and kitchens. Safe around food. Leaves no taste or odor.

MIDLAND NEO GERMOLYPTUS

An effective disinfectant, antiseptic and germicide with a mild, pleasant odor. Non-corrosive to metal, rubber goods or enamel ware. (May be used to advantage to replace Compound Cresol Solution, U.S.P.)

MIDLAND LACQAIRLUSTR

The finish made by lightly buffing in Lacqairlustr with cheesecloth, whether on wood, metal or leather surfaces, gives a perfectly clear film of protection. Its bright, gleaming lustre does not finger-mark or hold dust.

The real beauty of furniture and woodwork can be brought out with one easy application.

MIDLAND PIPEOLEUM

An efficient drain pipe cleaner which attacks waste, etc., in clogged pipes without harm to the plumbing. Regular use of Pipeoleum may eliminate costly plumbing bills.

MIDLAND BASIC LIQUID SOAP

Midland Basic Liquid Soap is an ideal Liquid Soap for Schools. It contains cocoanut oil, glycerine, olive oil and other fine ingredients, carefully blended to a soft, smooth, non-irritating liquid soap that has a pleasant odor.

Midland Basic Liquid Soap may be diluted to any strength desired.

MIDLAND ATHALOH

This product was conceived by our chemists for use in stepping-pans and as a special disinfectant in and around shower-rooms, pools, and locker rooms to aid in the prevention of the infection known as "Athlete's Foot."

GENERAL FLOORCRAFT, INC.

333 Sixth Ave., New York City

The Low Cost Quality Line

A SIZE TO SUIT EVERY NEED AND BUDGET

THE LOW TONE SINGLE-BRUSH GENERAL FLOOR MACHINE

HEAVY DUTY ALL GEAR DRIVE

Waxes . . . Polishes
Scrubs . . . Dry Cleans
Refinishes All Types of Floors

You can try the GENERAL on your floors before you buy it. Full information and prices on request

One Year Guarantee

Made in 5 sizes—11″, 13″, 15″, 18″ and 21″ brush diameter

POWERFUL—EFFICIENT—NOISELESS—The primary function of any electric floor machine is performance of its duties efficiently at lowest cost. More power and more speed assure efficiency and economy.

To obtain all these advantages, the **Low Tone General** single brush, gear-driven electric floor machines are **correctly engineered** and designed, so that maximum motor power is actually utilized in performance of floor work. All gears are fully enclosed in grease leak-proof housing. No waste in complicated construction.

Low Tone General floor machines are powered by motors of rugged and modern design and have unusual quick starting action and reserve power. Perfect balance and simplicity of construction are features of this modern floor servant.

Made in Five Distinct Models

SPECIFICATIONS

	Model S-11	Model S-13	Model S-15 Sr.	Model S-20	Model S-18 Sr.
Motor (Heavy Duty)	¼ H.P.	½ H.P.	½ H.P.	1 H.P.	¾ H.P.
Brush Diameter	Full 11″	Full 13″	Full 15″	Full 21″	Full 18″
R.P.M. of Brush	170	170	170	150	150
Pressure on Brush Complete	45 lbs.	75 lbs.	95 lbs.	140 lbs.	110 lbs.
Cable Length	40 ft.	40 ft.	40 ft.	60 ft.	40 ft.

Made in three sizes—14″, 18″ and 22″ brush spread

GENERAL TWIN-BRUSH "NOISELESS" FLOOR MACHINE

The **General** Twin-Brush Models were designed and developed to meet a very specific need—permanent quietness of operation, in schools and institutions where quiet is essential. These twin-brush models have no gears, no chains, no grease. They are driven by a series of heavy-duty multi-V belts and carry a permanent guarantee against noisy operation. They are even quieter in operation than the Single-Brush "Quiet" model, without sacrificing any mechanical engineering qualities that have made this "Quiet" model the choice of so many schools in the past. **Guaranteed Permanently Noiseless.**

GENERAL "HOME MODEL" ELECTRIC FLOOR MACHINE

A light weight (18 lbs.), light duty all-purpose floor machine for homes and other small floor areas. Ideal for polishing and cleaning desk tops. Will get under all furniture. Extremely low price.

FREE TRIAL OFFER

The many advantages of the **General** line of floor machines may be seen on your own school floors. You can try a **General** before you buy one. Our representative will call to demonstrate, or, if you prefer, a ten-day FREE trial of any model can be arranged—without obligation to buy.

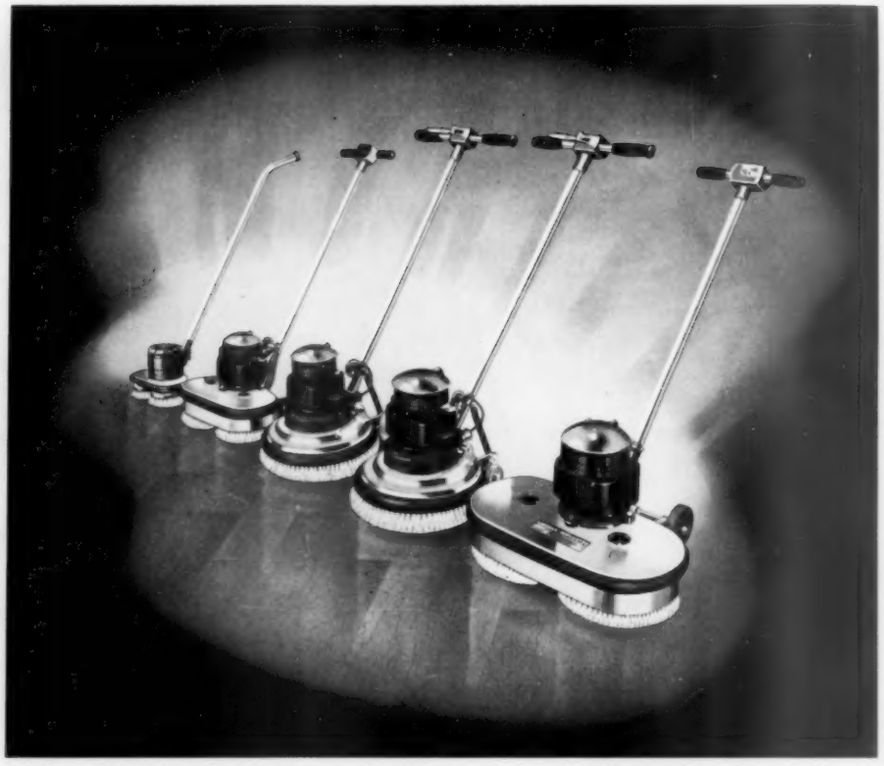
Agents or Dealers in all Principal Cities

LINCOLN-SCHLUETER FLOOR-MACHINERY COMPANY, INC.

Manufacturers
231 W. Grand Avenue, Chicago, Ill.
Phone: Superior 8944

★ 43 YEARS OF SERVICE

Nearly half a century of floor machine engineering has proved to be a vital factor in the efficient and dependable performance of Lincoln-Schlueter floor maintenance equipment. Over 40 models are available for every possible floor-conditioning operation on surfaces of all types and materials, regardless of age or condition. These machines quickly pay for themselves out of savings in time, labor and materials.

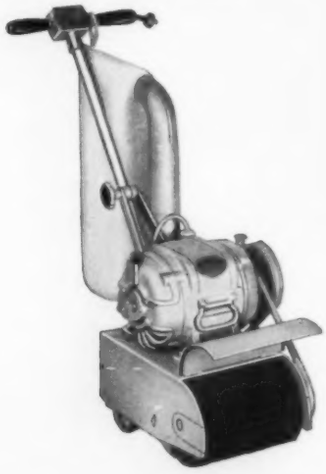


No. 11 No. 16 No. 15 No. 18 No. 20

The Lincoln Line of FLOOR SCRUBBING and POLISHING Equipment

No. 11. Small office or school model, with two brushes covering a floor span of 11 inches. Like all Lincoln models pictured above, you can use it for scrubbing, waxing and polishing floors of wood, linoleum, tile, concrete, etc. Even a child can operate it.

No. 16. Especially designed for efficient, fast and economical scrubbing and polishing in medium-size schools and institutions. All Lincoln polishing machines come fully equipped with interchangeable scrubbing and polishing brushes. The floor span of this machine is 16 inches.



3 MACHINES FOR PRICE OF ONE!

LINCOLN-SCHLUETER MULTI-PURPOSE

Sands — Steel-Wools — Waxes and Polishes

Especially valuable for a variety of floors of different materials and of different age and condition. Sands old, warped, worn wood floors to reveal the hidden surface of smooth new wood. STEEL-WOOLS to remove accumulated oil, seal and grime, and to aid distribution and penetration when new seal is applied. WAXES and POLISHES wood, linoleum, tile, composition, concrete and terrazzo floors in your halls, classrooms, gym, auditorium and laboratories. Takes but a few minutes' time to change drums.

No. 15. The Lincoln Single Disc "Sphinx" Silent Polisher and Scrubber. Full weight of the motor directly over brush. Perfectly balanced for easy operation. Equipped with safety switch. Brush covers in excess of 15" floor span and works right up to baseboard.

No. 18. This heavy duty single disc "Sphinx" Silent Polisher and Scrubber has a floor span of 18" and is ideal for large areas. Has an automatic safety switch, extra length guide handle and life time lubrication. May be equipped with tank and automatic water feed if desired.

No. 20. Heavy Duty Twin Disc model . . . the world's fastest and most efficient polishing and scrubbing machine. Has 21" brush span. The twin brushes revolve in oppsoite directions eliminating all side pull or whip—thus even with its size this machine is guided without effort.

Weighs but 16⅔ Lbs.

For Table and Desk Tops–Stairs–Trim –Sills–Panels–Manual Training

NEW PORTABLE DUSTLESS DISC SANDER

Desk and blackboard sanding or refinishing is easy for your janitor or handy man with this streamlined portable sander. Doubles as manual arts shop equipment, sands furniture, millwork, desk and table tops, trim, stair treads, panels, etc. LEAVES NO DUST. Powerful suction captures all sand, grit and wood particles and "bags" them for disposal. Equipped with headlight for work in dark corners. Flexible 7" sanding disc conforms readily to uneven surfaces.

Guaranteed FOR 1 YEAR INCLUDING MOTOR

Write Today for Descriptive Literature, Prices, Specifications and Details of Free Trial Offer

G. H. TENNANT COMPANY

Established 1870

GENERAL OFFICE AND FACTORY

Minneapolis, Minn.

EASTERN SALES OFFICE: Westfield, N. J.

THE TENNANT FLOOR MAINTENANCE SYSTEM

The Tennant Floor Maintenance System offers a scientifically correct procedure for the treatment of new wood floors and for the re-conditioning, cleaning, maintaining and re-finishing of old floors.

During the short time this modern process has been on the market it has been adopted as the standard floor maintenance method by school systems in all parts of the country, by the United States Government and by leading industrial firms.

The Tennant System is entirely different from any other floor maintenance process.

Further information, with illustrated circular, will be sent on request. One of our trained floor experts will gladly demonstrate the Tennant System for you, and tell you of floors in your own locality maintained by Tennant Dry Cleaning.

THE TENNANT FLOOR MACHINE—MODEL C

Can be Used with 8″ or 16″ Steel Wool Rolls, 8″ Sanding Drum, 8″ or 16″ Scrubbing or Polishing Brushes Dustless Dry Cleaning . . . Dustless Sanding . . . Polishes Waxes . . . Seals and Burnishes . . . Scrubs

Demonstration of Tennant System of Floor Maintenance at Convention of National Association of Public School Business Officials

INVINCIBLE VACUUM CLEANER MFG. CO.

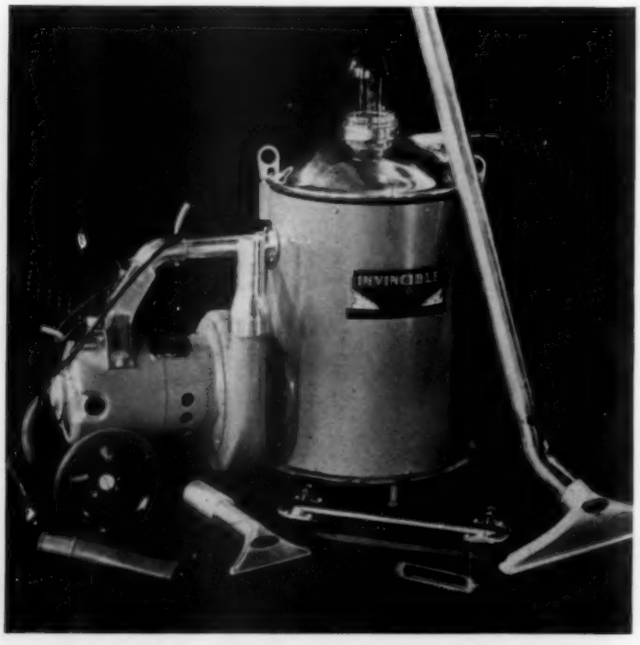
5000 Davis St., Dover, Ohio

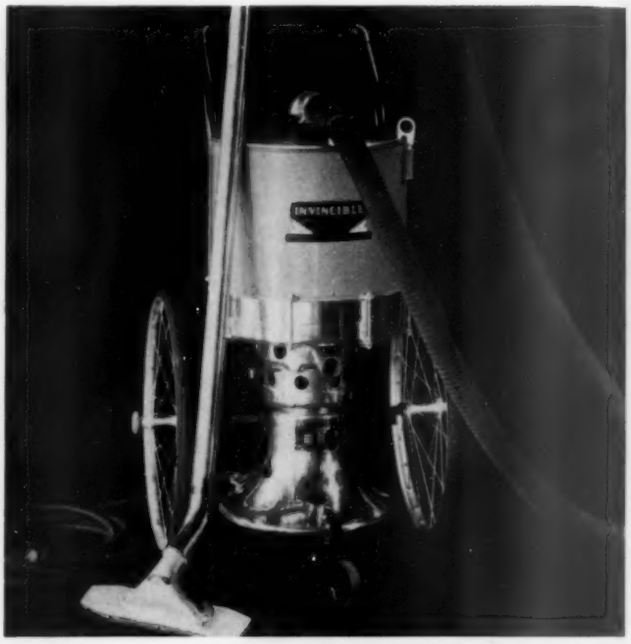
INVINCIBLE HEAVY DUTY PORTABLE VACUUM CLEANERS FOR SCHOOLS

In schools, colleges, universities and buildings everywhere, Invincible Cleaners are affording the highest standard of cleanliness at a remarkably low yearly cost. Powerful suction completely removes all dust and dirt from any surface within the building. Although rugged, "Invincibles" are compact, light in weight and extremely portable. Thus, they are easy to use in congested areas, and immaculate cleanliness is accomplished with an actual saving in time.

Application—Invincible Vacuum Cleaners thoroughly and quickly clean every kind of floor, walls, furniture, chalk troughs, erasers, shelves, stairs, boiler rooms, and, in fact, every surface. A wide assortment of tools is offered to meet any cleaning need properly. The Invincible Tool Swivel enables operators to easily and quickly clean under desks, furniture, and in corners, etc.

Results—Aside from immaculate cleanliness and rapid cleaning, "Invincibles" completely remove the fine dust from the minute pores in flooring. This prevents wear under traffic and no dust remains to be scattered into the air to accumulate on walls, equipment, etc. Cleaning and redecorating costs are reduced, and even the atmosphere is cleaner.





INVINCIBLE UNIVERSAL PORTABLE (Above)

This ¾ horsepower unit develops tremendous cleaning power and is designed for use where thorough cleanliness must be accomplished in the least possible time. Its sturdy, rugged construction, with no overhanging parts, no stress, no strain, is approved by engineers throughout the world.

Mounted on its large, swivel-wheeled carriage, it is extremely portable, and it is not necessary to use long lengths of cumbersome hose, which saves time, and it may be easily wheeled up and down stairs. There are no exposed or inflated bags to permit dust seepage, or to handicap the operator. All dust and dirt is securely held in one large, metal-enclosed container which can be removed, emptied and replaced in less than ½ minute.

Picking up abrasive dirt or metallic litter cannot injure this machine in any way, as all separation takes place before the air reaches the vacuum producer. Hence, there is no wear or tear on the mechanical parts, and unvarying efficiency is assured. This machine will give years and years of dependable, efficient service.

INVINCIBLE ALL-SERVICE (At left)

This ½ horsepower, heavy-duty model is smaller and lighter in weight than the Universal Portable, yet it embodies all of the superior Invincible Features—totally enclosed separation unit, lightness, compactness, extreme portability, ease of operation and sturdy construction. It is a remarkably efficient heavy-duty cleaner at a surprisingly low cost.

Although the two units shown are the most widely used in schools, there are eight other "Invincibles"—ten in all. There is an Invincible Model that will exactly meet any cleaning requirement, small or large. We shall gladly furnish complete information, recommendation and quotation on request.

THE SPENCER TURBINE COMPANY

Hartford, Connecticut

THE SPENCER CENTRAL VACUUM CLEANING SYSTEM

The Spencer Central Vacuum Cleaning System has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Spencer Central Vacuum Cleaning is a permanently installed system for the speedy and complete removal of dirt and dust from all kinds of floors, walls, ceilings, furniture and other building equipment. It consists of five essential parts, each carefully selected to meet the special requirements for each individual building:

1. A vacuum producer, located in the basement. 2. Inlet valves, conveniently located on all floors and piped to vacuum producer. 3. Specially designed, entirely enclosed, and easily cleaned separator. 4. Light weight, flexible hose. 5. Special vacuum tools for each operation.

Advantages—In exhaustive tests in leading schools, the powerful vacuum, scientifically applied with correct tools, has demonstrated its ability to remove more of the dirt in less time than other methods.

Because the equipment is simple in design, requiring little attention and because these systems are built to provide satisfactory service over long terms of years, both the operating and amortization costs are extremely low.

One janitor can clean twelve average sized class rooms in two hours with a 3 Hp. Spencer System. The Spencer elbow joint makes cleaning around furniture easy.

For Cleaning Erasers and Chalk Trays—Spencer Vacuum Cleaning, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of eraser or chalk tray.

Cleans the Boiler Room—Spencer Vacuum cleans boiler room floors—removes dust and soot from pipes and draws soot out of the boiler tubes, often saving the whole cost of operation in this one item alone.

Swimming Pool Cleaning Equipment—By means of special cleaning tools usually employed in connection with the pump on the filtering system it is possible to remove accumulated sediment from swimming pools without the waste of water involved in draining the pool. Bulletin on request.

SPENCER PORTABLE VACUUM CLEANERS

The Spencer ⅓ Hp. Portable Vacuum Cleaner shown above weighs only 34 pounds. The ¾ hp. unit shown below weighs 150 pounds. Both are built on the same principles of design as the larger Spencer units, and use the same vacuum tools. Easy to clean, easy to use, and built for long life service.

UNITED LABORATORIES

INCORPORATED

MAINTENANCE RESEARCH

Executive Offices: Euclid at Ivanhoe, Cleveland, Ohio

ASSOCIATED OFFICES IN ALL PRINCIPAL CITIES

THE maintenance of property is a specialized job and should not be delegated to one who can devote only spare time to it. There is a most confusing list of maintenance products from which to choose. There are right and wrong ways of applying them. There are annoying problems to be solved.

For eliminating maintenance guesswork, we suggest United Laboratories. A combined maintenance experience of over a century is behind us. The personnel includes individuals of widely varied experience whose composite advice and service is available without charge or obligation. The products recommended by United Laboratories are tested, approved and certified before being offered to our clients. You are told what they will do, what they **will not** do, and how you can get the longest service from them. You are never asked to experiment at your expense.

Maintenance problems and their solution is our life work. We serve more than 50,000 clients through our 150 Field Associates who operate from our 16 Associated Offices.

PLASTIC ROCK

"Your Old Floor on Saturday Is a New Floor on Monday"

Plastic Rock comes to you in complete units. Each ingredient is sealed in its own container in proper proportion. Add water on the job and you have a mastic of the consistency of mortar. This mastic is spread from ¼" to ½" deep over your rough, worn, broken or cracked concrete or wood floors. It is troweled to a smooth finish and allowed to dry. Is used for patching as well as complete floor covering.

When dry, Plastic Rock is flexible, dustless, waterproof and as silent as rubber-soled shoes. It deadens sound, cannot splinter, crack, curl or loosen from the base. **It is absolutely fire retardent** because it is composed of inert materials.

Hundreds of schools and colleges have eliminated the expense of removing old floors in corridors, halls, wash rooms and locker rooms by installing Plastic Rock. It is 100% skid-proof, wet or dry.

Investigate Plastic Rock before you decide to rip up your worn-out floors.

STAIR TREADS: Worn stair treads and landings can be beautifully surfaced with Plastic Rock in a few hours' time. Absolutely skid-proof, wet or dry.

Plastic Rock Units are shipped complete. Simply add water and mix

The Plastic Rock mixture is spread and then troweled to a smooth finish

The resulting surface is quiet, flexible, sanitary, slip-proof and easily cleaned

Plastic Rock, explained above, is one of more than 100 products specified by United Laboratories. We specialize in roofs, floors, waterproofing, dampproofing and caulking. We supply special paints and coatings for resisting rust, heat, abrasion, fungus, termites, acid, brine, alkali, gas fumes, etc. Explain your problem to us. We may be able to offer a low-cost, efficient solution. Ask for a free copy of our Maintenance Checking Chart

A nation-wide organization devoted to supplying materials and unique methods of maintaining properties at low cost. From a list of over fifty different suggestions, several are listed below. Our Maintenance Checking Chart, summarizing our principal services, will be sent upon request without charge or obligation

STADIUMS — POOLS — STEPS — WALKS

We have a simple process for re-forming broken and frost-split concrete. Entire concrete stadiums are being reconditioned by this procedure which protects the structure against water, weather, expansion and contraction. The work may be done by your contractor or maintenance crew under our supervision. Complete details upon request.

TENNIS COURTS AND PLAYGROUNDS

If your courts or playgrounds need patching or complete new surfacing, we will show you how to do it. The cost is very low. If you are planning new courts, let us suggest cold asphaltic concrete topping. Recommended by the star players. Cost is low, Easy to install. Waterproof, clean and fast. Details upon request.

GYMNASIUM FLOORS — ALSO CORRIDORS AND SCHOOLROOMS

The Laboratory recommends Certified Wiping Varnish No. 479 for floors of all kinds. Also used for protecting desks, lockers, gymnasium equipment, etc. Covers 1000 sq. ft. per gallon one coat. No brushes required. May be applied by mop, cloth or sponge. Far superior to wax. Will not show rubber burns. Acid-proof, skid-proof, extremely flexible and tough. Dries in an hour or less. Contains Bakelite gum. Ask for Report No. 479 for details.

ONE-COAT WALL PAINT — 1000 SQ. FT. TO THE GALLON

Certified Hydall Paste No. 452 is used from coast to coast by schools, colleges, and institutions. Delivered in paste form, it is reduced with water on the job. Not a casein paint. A water base paint with all of the beauty and washable qualities of an oil paint. Dries in 15 minutes. May be applied over dampness, new plaster, cement or mortar. Will hide old water spots. Will never show "hot spots." In paste form, may be used as a crack filler or for patching small holes in plaster or wood. Absolutely odorless. Extremely low cost per square foot of coverage. Ask for Report No. 452 for details.

A SKID-PROOF PAINT!

If your stairs, ramps and inclines are in good condition, but slippery, give them a coat or two of Certified Armor-plate No. 419. This paint produces a surface that feels like emery cloth. Contains stainless steel alloy metal flakes suspended in a Bakelite liquid. Used wherever there is danger of slipping. Stairs, landings, ramps, inclines, step-ladder steps, boat decks, bus and car steps, floors of locker rooms, shower rooms, steps leading to swimming pools, etc. Ask for Report No. 419 to which is attached a sample of this most unique product.

ALLAN J. COLEMAN

Manufacturers of Sewer, Pipe, Closet and Drain Cleaning Tools

120 W. Illinois St., Chicago, Ill.

Flexible Closet Cleaners

COIL WIRE CLOSET CLEANER

Instantly removes obstructions from water closets, drain pipes, etc.

Grade A

C-510-515. Flexible Coil made of a special prepared non-corrosive **Swedish Spring Steel Music Wire** No. 12 gauge, ½" size, with removable corkscrew and cone wire.

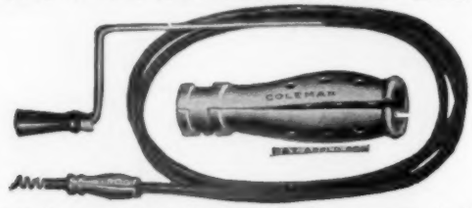
C-510—3-ft. Music Steel Wire Spring $4.50
C-515—6-ft. Music Steel Wire Spring 5.50

Grade B

Made of good oil-tempered steel, 12-gauge wire ½-in. size.

C-516—3-ft. coil, black enameled... $3.50
C-517—6-ft. coil, black enameled... 4.50

FLEXIBLE COIL WIRE SEWER AND PIPE AUGERS WITH AUTOMATIC GRIP HANDLE



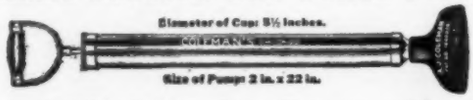
For use in removing obstructions in vacuum, drain pipes or sewers. Made of the best oil-tempered spring steel, and are flexible, enabling them to turn bends and go through traps. Made with cork-screw and handle complete, also furnished with automatic grip handle.

Style No.	Size, Ins.	6-Ft. Lgth.	9-Ft. Lgth.	15-Ft. Lgth.	25-Ft. Lgth.	50-Ft. Lgth.	100-Ft. Lgth.
C-520a	3/16"		$1.25		$2.25	$3.80	$6.80
C-520b	¼"		1.55		2.70	4.25	7.65
C-520	5/16"	$2.00	2.70	$4.50	6.75	10.20	17.00
C-525	½"	2.25	2.90	4.95	7.20	12.75	21.25
C-528	5/8"			5.85	8.10	13.60	25.50

	Price
C-530—¾", 10-ft. sec., hdl. and corkscrew	$5.50
Extra 10-foot section	5.00
C-535—1", 10-ft. sec., hdl. and corkscrew	6.50
Extra 10-foot section	6.00

Nos. 530 and 535 are furnished with handles and corkscrews and all connections. Made in 10-foot sections.

BRASS SUCTION AND FORCE PUMP

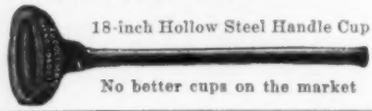


Large reversible Rubber Cup. Fits any opening up to 5 inches. Wonderful article for opening sinks and drains.

C-500—Pump with Cup. Weight, 6 lbs. ..... Each $12.00
C-505—Cup only. Weight, 1 lb. ..... Each 1.50
C-508—Graphite packing rings ..... Per set 1.50

SUCTION AND FORCE CUPS

High grade rubber. All handles secured to Cup by threads and sockets.

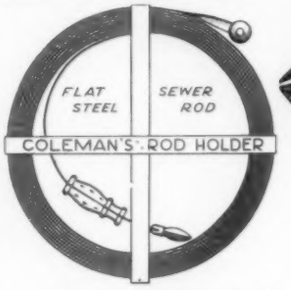


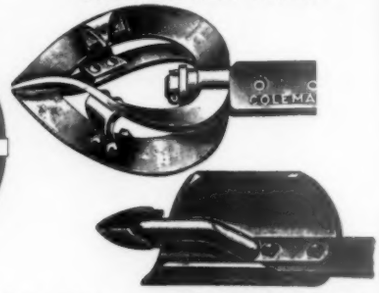
18-inch Hollow Steel Handle Cup

No better cups on the market

Style No.	Size, Ins.	Color	Wood Handles, Ins.	Price Per Doz.
C-545	5½	Red	Steel 18	$24.00
C-550	5½	Red	Cup Only	18.00
C-555	5½	Red	Wood 30	15.00
C-560	5½	Black	Wood 30	12.00
C-565	4½	Red	Wood 30	9.00
C-570	4½	Black	Wood 30	7.80

Giant Revolving Sewer Cleaning Spear Points and Root Cutters





For cleaning out straight sewers or drains. Made of a special oil-tempered, flat spring, steel wire. Equipped with spear point, roller ball and grip handles, which increases efficiency. Use either end.

Style No.	Size, Ins.	25-Ft. Length, Each	50-Ft. Length, Each	*75-Ft. Length, Each	*100-Ft. Length, Each
C-532	⅛ x .030	$1.25	$1.75	$2.50	$3.50
C-534	3/16 x .030	1.50	2.50	3.50	4.50
C-536	¼ x 1/16	1.85	3.50	5.00	7.00
C-537	½ x 1/16	2.40	4.50	6.00	8.00
C-538	¾ x 1/16	4.00	6.00	8.00	10.00
C-539	¾ x ⅛	6.00	8.40	12.00	16.00
C-539a	1 x ⅛	7.00	10.20	13.80	18.90
C-540	1¼ x ⅛	7.20	10.80	14.40	20.00
C-542	1½ x ⅛	8.40	12.00	18.00	24.00

* Furnished with Frame. Other lengths, 75 cents extra.

CONDUITS AND SEWER RODS WITH NEW FRICTIONLESS COUPLING

C-543—COLEMAN'S SECTIONAL SEWER AND CONDUIT RODS are made of the best grade of 1⅛" hickory, 3 ft, or 4 ft. lengths, coupled together with Coleman's latest Most Improved "FRICTIONLESS" 1⅛" Certified Malleable Iron Couplings.

Experience has taught us that there is a great amount of friction and drag caused by the Couplings and Rod dragging flat on Pipe.

Repeated tests have caused the development of COLEMAN'S "FRICTIONLESS" COUPLING. Rods touch on four wings or planes on our Improved "FRICTIONLESS" Coupling eliminating this friction and drag to a minimum.

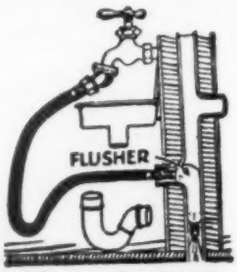
A Heavy Duty Sewer Rod

C-543—Rod with couplings 1¼" x 3', wt., 2 lbs. $1.10
C-543a—Rod with couplings 1⅛" x 4', wt., 2¾ lbs. 1.20
C-625—Rod with couplings ⅞" x 3', wt., 1½ lbs. ..... .90
C-675—Rod with couplings ⅞" x 4', wt., 1¾ lbs. 1.00

Tools for Above Rods. Write for Prices

HYDRAULIC FLUSHER

House Faucet Connection. Standard Size of Flusher for House Plumbing That Gives Results.



This Sewer Flusher is made of several plies of water-tight heavy rubberized fabric which makes it Strong, Durable and Flexible, easy to insert into traps, vents, curved sewer drains or pipes. A very efficient article when it is necessary to wash out pipes or sewers. When connected with strong water pressure, flusher is expanded to size of drain, thereby giving a direct water pressure close to stoppage. Sizes to fit all pipes. Write for prices.

"GUARD HEALTH" By Using COLEMAN'S Tools to Keep Sewer Drains Running Freely and Have Sanitary Buildings

SECTION V
LANDSCAPE DESIGN AND DEVELOPMENT

PRINCIPLES GOVERNING THE LANDSCAPE DEVELOPMENT OF GROUNDS FOR EDUCATIONAL INSTITUTIONS

By CHANCE S. HILL and ALBERT D. TAYLOR

Landscape Architect, Downers Grove, Ill. Landscape Architect, Cleveland, Ohio

IN recent years boards of education and trustees for educational institutions have become keenly aware of the importance of landscape design and construction in the development of their institutions. Many of them have learned by experience that a haphazard, unstudied growth over a period of years is costly not only from a financial standpoint, but in the important matter of prestige with the general public. Institutions and school systems not infrequently have developed buildings and their surroundings that are not a credit to the school or to the communities in which such institutions are located. Different styles of good and bad architecture in the past have developed side by side on college campuses without regard to any general and practical scheme of design.

Roads, parking spaces and paths have not always been designed and built for attractive appearance, convenience or ease of maintenance. Many campus areas have not been studied to produce a logical and proper relationship among the buildings, with the result that future expansion is handicapped and present use is impaired.

Such procedure has resulted in a realization that in every educational institution the administrators have a direct public obligation to guide its growth in an orderly manner. This applies not only to the college or university campus, but to the widely scattered units of a public school system.

The problems of landscape architecture in the educational field fall largely under two types of work: first, the design and construction of the grounds surrounding single buildings in the public school system —grade schools, junior high schools, and senior high schools; and, second and more complex, the design of the college or university campus with its many buildings and special requirements.

The problems are best approached through the cooperation of four agencies—the school authorities, the consultant on educational matters, the architect, and the landscape architect. This cooperation should proceed through the various phases of the work, beginning with the preparation of a general plan for the public school property or the college campus, and extending through the entire program of preparing detailed plans and specifications. The construction and planting work should be governed by carefully detailed construction drawings and specifications, and should be executed under experienced, competent supervision.

Errors of short range and inadequate planning evidenced in some of the older institutions have resulted in a decreased unity of design in buildings and their surroundings, and also increased costs for maintenance and the rebuilding of structures. No program of the future, involving buildings and surrounding lands, should be considered without the adoption of a coordinated program of planning which will not only provide an economical design on the basis of which immediate work may proceed, but also provide amply for future growth of the institution; thus producing a unity of practical design and real permanency of construction.

The studies herewith presented are grouped in two divisions: first, the problems of landscape design; and, second, the problems of landscape construction. They are so divided in this discussion.

Landscape Design

Public School Systems

An increasingly important consideration in the development of public school systems is that of selecting sites for the schools. Locations on main traveled highways should be avoided because of the traffic hazard and also the high cost of land for initial development and subsequent expansion.

GRADE SCHOOLS

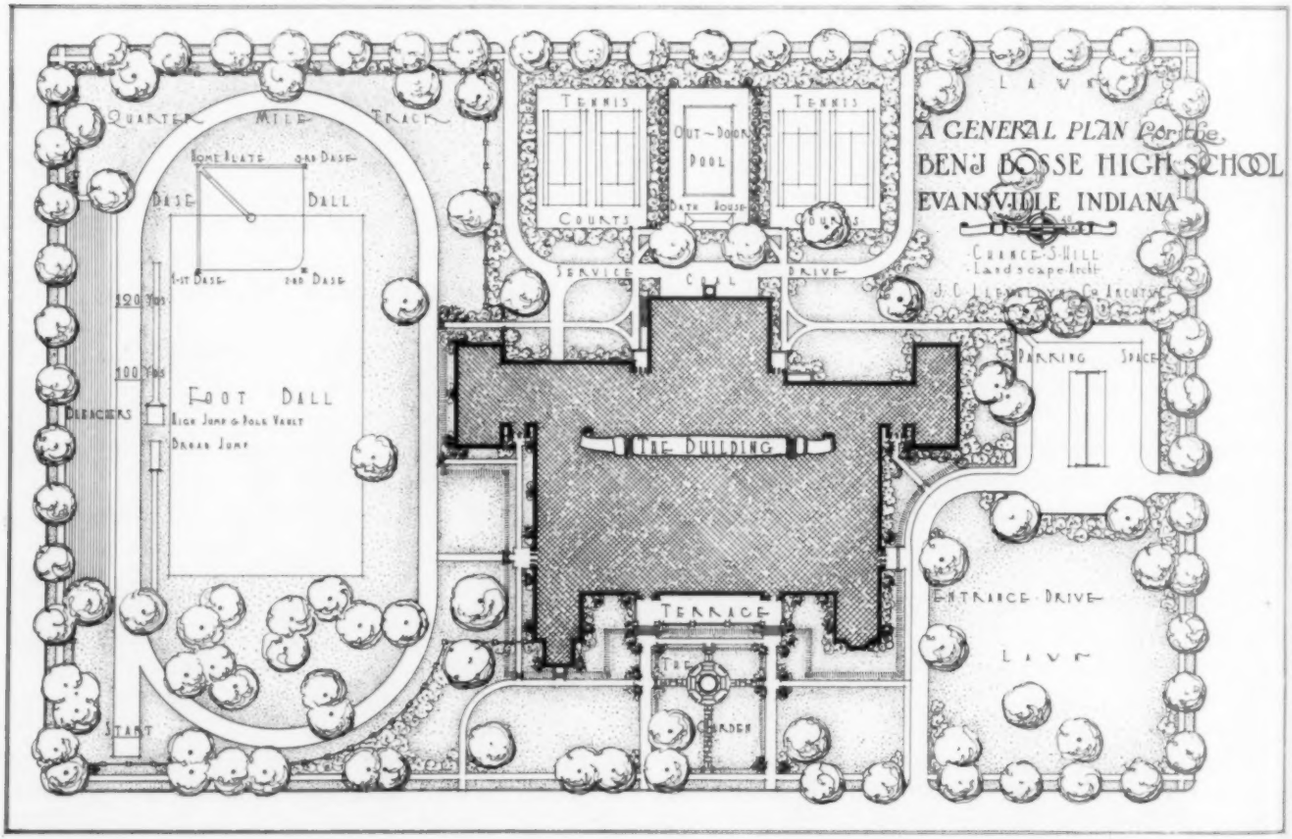
The location of a grade school building on its site is dependent on such factors as the size and orientation of the site, the topography, the location of existing vegetation, the outlook, and existing traffic hazards as they relate to the entrances and exits of the property and the building. The basis for such a study should be an accurate topographic map giving all pertinent data. As a general rule, the building should be located near one side or end of the property, with sufficient area between it and the street to allow for the making of an adequate and pleasing setting. Such a location permits the maximum use of the remaining area for play purposes. Walks should be direct and wide enough for the traffic load.

Provision should be made for the loading and unloading of car passengers at the curb entrances to the walk system. Service areas and drives should be as inconspicuous as possible, and fitted into the general landscape scheme attractively.

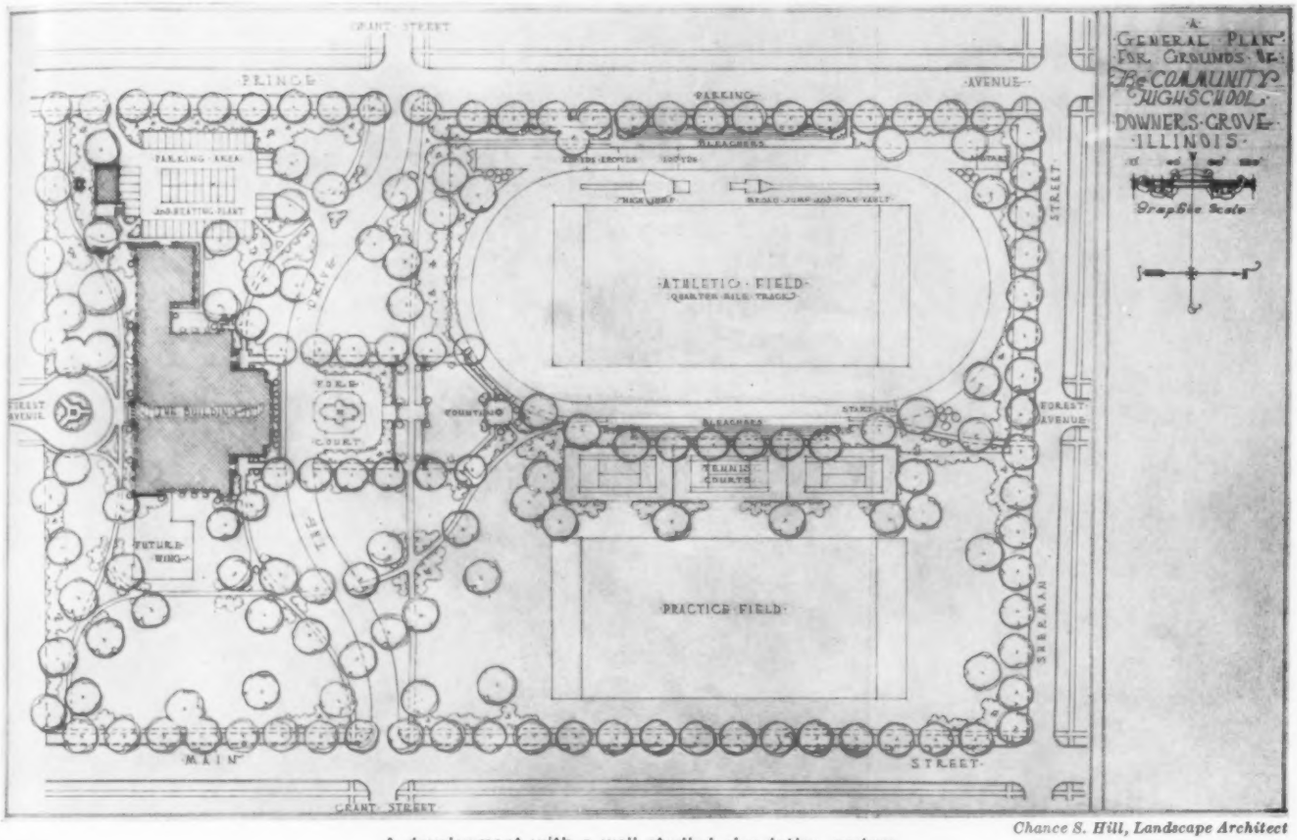
Play areas should be designed to meet the requirements of various ages, and furnished with drinking fountains, game space and equipment. They should be fenced for safety, and screened from public view by appropriate plantings of hardy trees and shrubs, valuable also to produce shade and pleasing landscape effects.

In planning the landscape setting with the plantings, every effort should be made to make the buildings and grounds a pleasing addition to the neighborhood. Due regard should also be given to the planning of any future additions to the building, so that they may not disrupt the entire scheme of development at a later date.

As a general rule, approximately three acres surrounding a grade school will furnish opportunity for supplying the usual recreational requirements. A slightly larger area would provide a less restricted



The design of the general plan for The Benjamin Bosse High School, Evansville, Ind., was influenced as to building location and arrangement of areas by existing large trees



Chance S. Hill, Landscape Architect

A development with a well-studied circulation system

handling of such running games as playground ball. From three to five acres, depending on enrolment and recreational needs, should be a safe guide in land purchases where the development is not restricted by physical peculiarities.

The junior high school, with its expanded athletic program, requires approximately double the above acreage. As a rule, ten acres may be considered a *minimum* requirement.

HIGH SCHOOLS

The foregoing principles apply also to the design of grounds surrounding junior and senior high schools. The problems, however, are usually more complicated, and the requirements for land area are much greater, ranging for senior schools from a minimum of 15 acres to sites of 50 or 75 acres.

Most properties of this extent show considerable variation in topography, and when partially wooded create real problems in skilfully locating the various building units so that they may fit correctly into the varied topography, be economically and properly constructed, function efficiently in actual use, and result in a completed landscape composition that will be harmonious and pleasing. Each site, because of its individuality, becomes a problem of design in itself, which can be successfully solved only through a thorough study of all factors of topography, exposure, soil conditions, drainage, requirements of use, etc.

Provision must be made for ample lawn areas in conjunction with proper settings for the buildings. The walks should be of adequate width and made an appropriate part of the landscape picture, always direct and providing little excuse for student traffic to cut across lawns and wear new paths.

The athletic areas must be fully considered. They generally include tennis courts, outdoor basketball and volley-ball courts, hockey fields and archery for girls, baseball diamonds, football fields for practice and regular games, bleachers, a running track with 220-yard straightaway, and provision for field events. In many cases school garden plots are added to these requirements. All these diversified features must be so placed in the design that they will function properly and fit naturally into the final development. The successful solution of such a problem is not an easy task.

This is particularly true in the laying-out of large game areas where the topography is uneven and where trees of real value control the design to a marked degree. Such problems are further complicated by the necessity for securing the proper orientation of the various units with regard to the sun. All these requirements must be met, and the units must be so

Views of Downers Grove, Illinois, Community High School development. (See grounds plan on page 205)

Above—The heating plant

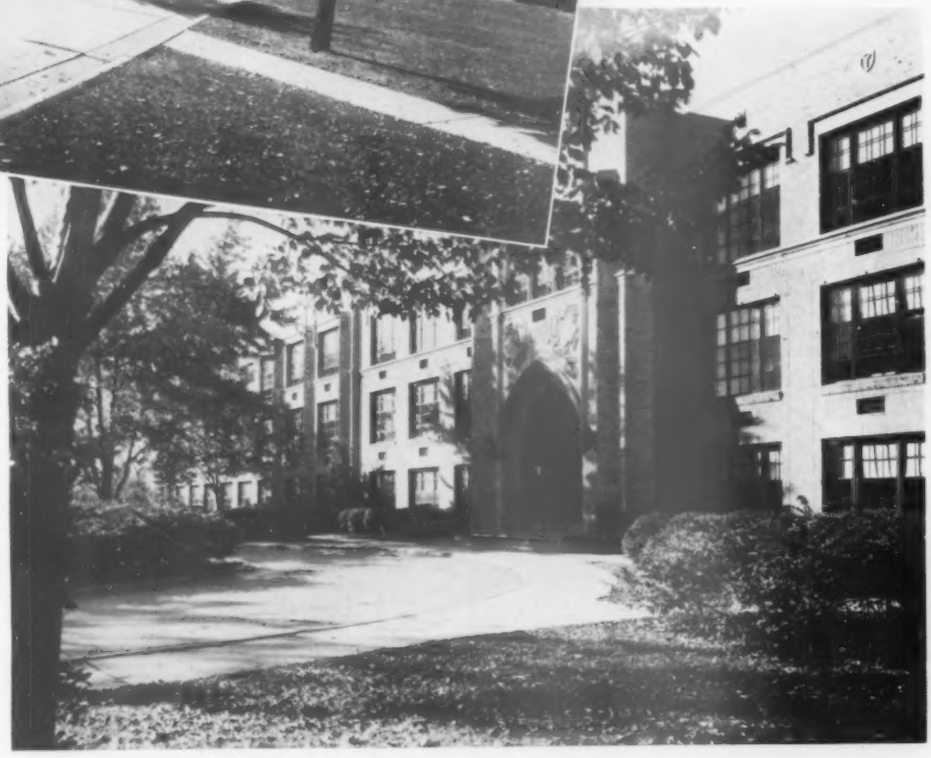
Above—To the parking area

Left—The turn-around and athletic field

The general plan shows the value of a well-studied circulation system leading to the building and the various areas

Above—Front façade of building, from southwest

Above—Northeast approach to the building



Right—The main entrance

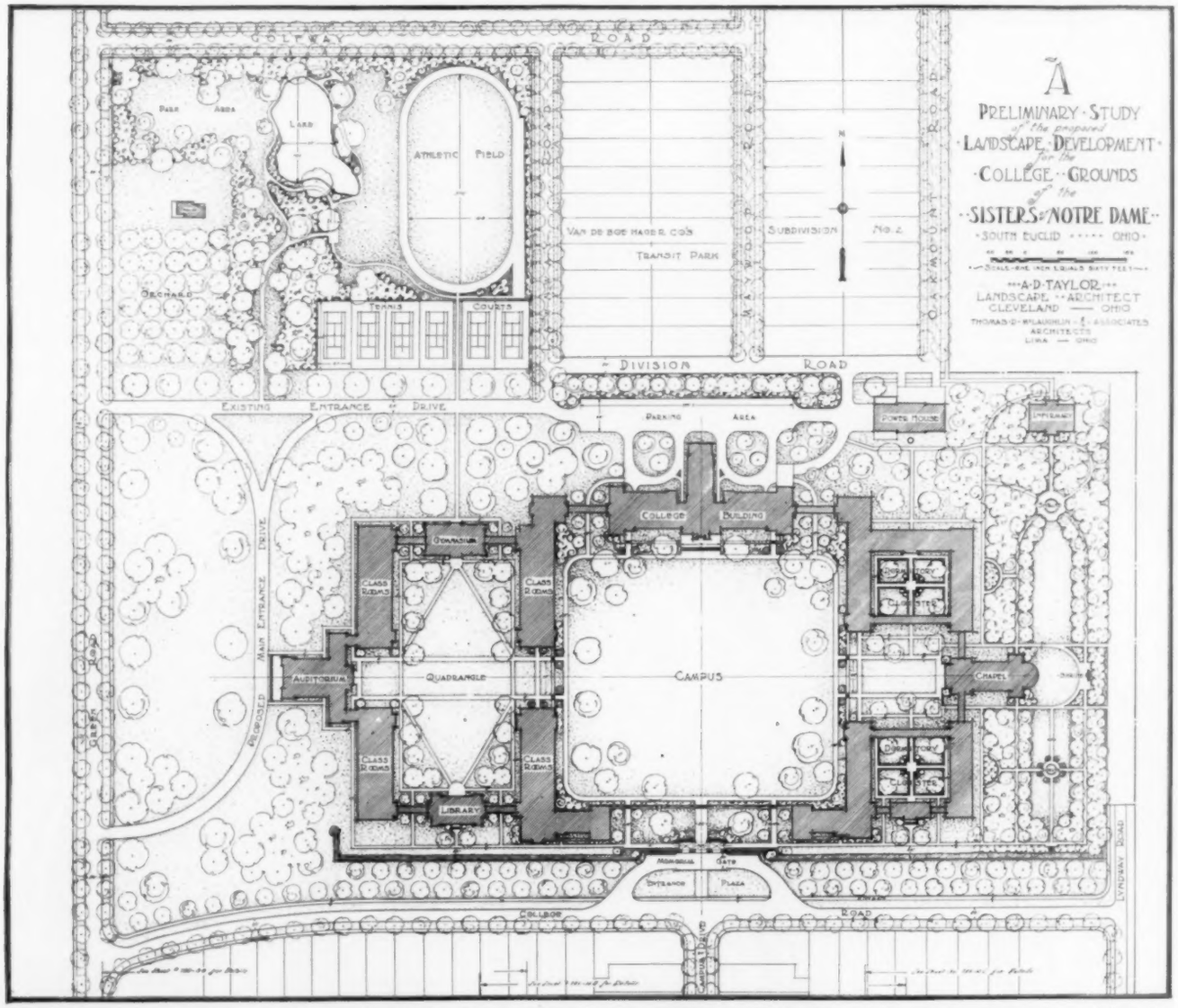
designed that their construction cost for grading, drainage and maintenance will not be excessive. This study requires not only a fund of sound technical knowledge, but also a great deal of practical experience with such problems.

The planting for high-school sites should be simple and easy to maintain, consisting mostly of hardy trees and ornamental shrubs. They should enhance the effect of the buildings; help develop a park-like setting; frame lawn areas; screen parking spaces, tennis courts and backstops; and give interest to boundary lines and intersections. At the same time, they should, through mass, individual form and height, lend dignity and simplicity to the school setting.

The effect of such surroundings on the minds of school children and of the entire community cannot be estimated in taxpayers' dollars, but only in an intangible feeling of individual well-being and a proper public pride in the school system.

The College or University Campus

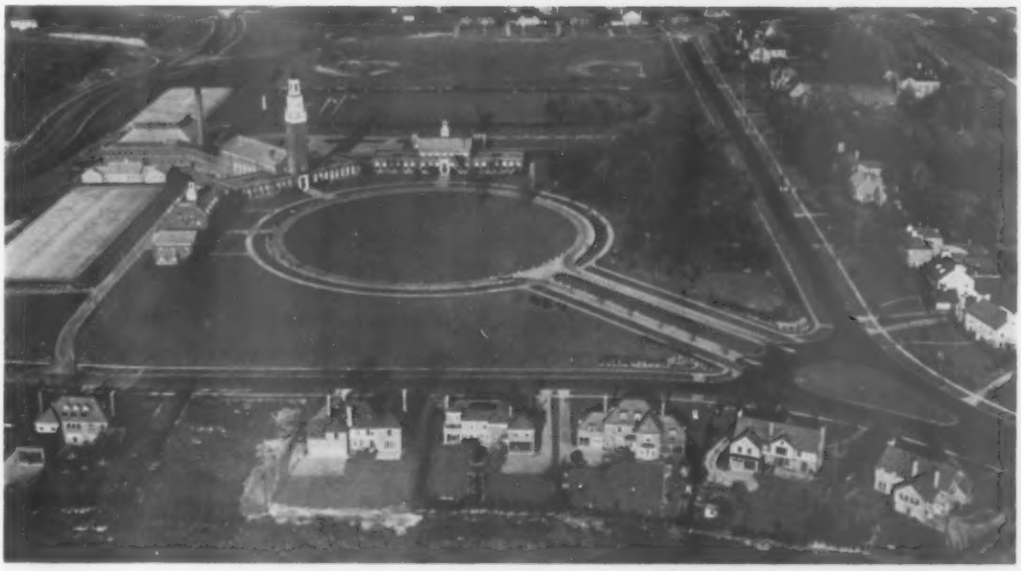
Colleges and universities are frequently affected with "growing pains," and these are rendered particularly acute when a real expansion problem must be faced where the previous growth has continued without a carefully studied plan allowing for future development. In most cases of this character it is found that the existing buildings are of no consistent architectural style, crowded together, and without a well-studied circulatory system with adequate parking facilities to meet modern conditions. Frequently the campus is restricted and it becomes necessary to make a study for the acquisition of additional acreage before the problem can be approached intelligently.



Where the area is limited and the possibilities for future growth are somewhat indefinite, the quadrangle development providing for future expansion is generally the most logical solution to the problem of preparing a plan which produces an interesting and logical arrangement of building units together with a surrounding landscape composition which produces an appropriate setting for the growing institution

Wooster College, Wooster, Ohio

An adequate development of attractive trees, when matured, becomes an invaluable asset on the college campus, such as is here illustrated



University School, Shaker Heights, Ohio

The initial development of this boys' preparatory school makes provision for increasing the height of the main central building, and the further development of this school property to meet the demands for teaching and for recreation of the ultimate student enrolment in this institution

Cleveland Heights High School, Cleveland Heights, Ohio

In selecting the site for a high school with a large student population, adequate facilities must be provided to meet the recreation requirements, as shown in this illustration

Photographs by courtesy of Aerial Surveys, Inc.

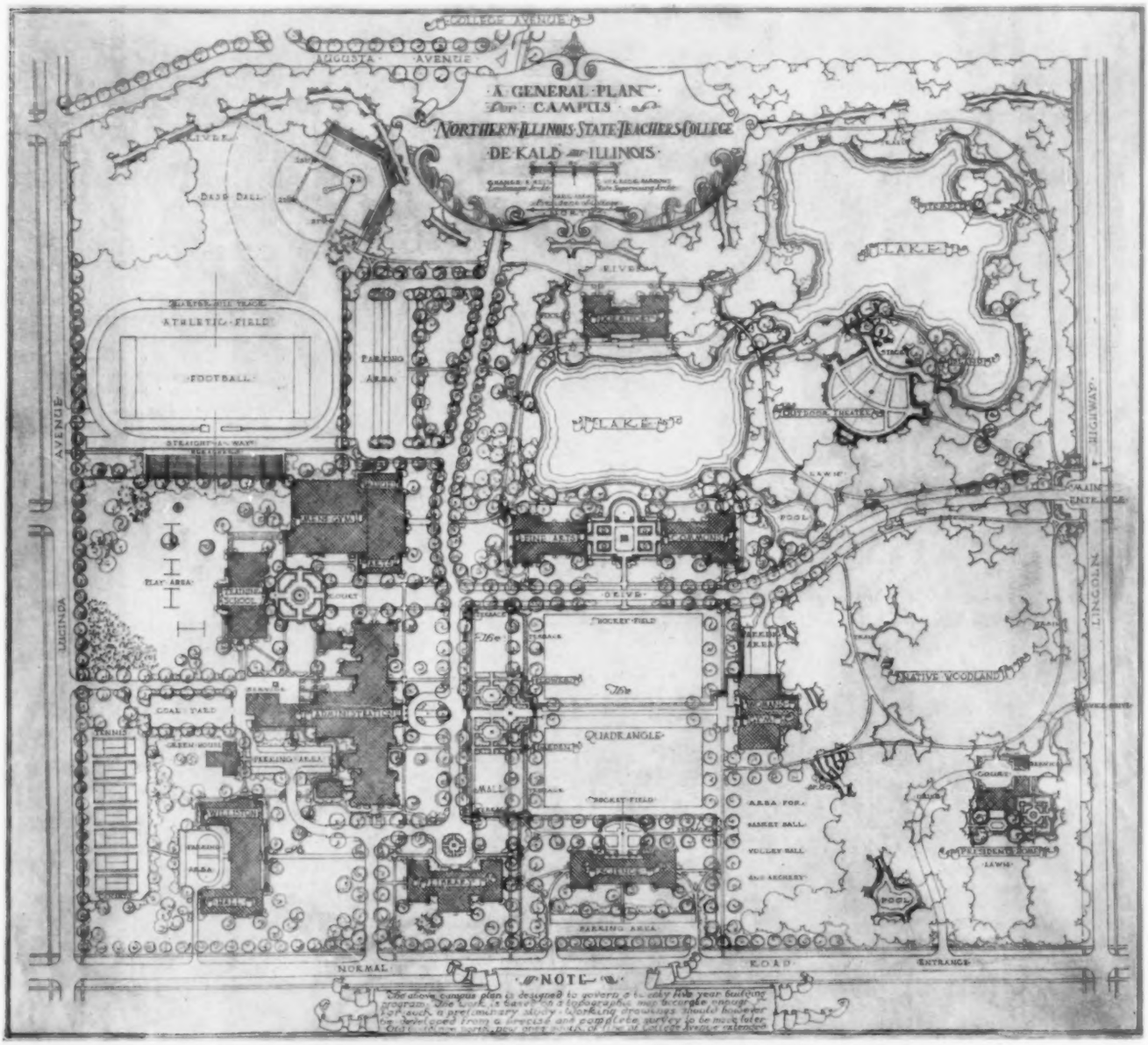
Some eastern college campuses—especially the older ones—are located on the tops of ridges or "tongues" of land, thus presenting particularly difficult problems when expansion takes place.

The first step is to determine through consultation with the college authorities the future trend of the development, especially as to its character and size. It is most unwise to attempt any expansion without first having a thorough knowledge of all requirements. Equipped with this knowledge, it is wise to set up a building and land-use program to meet these needs over a definite period of years. The student population for this period should be forecast as accurately as possible, and thus the character and size of the various new building units and areas can be determined by the architect and landscape architect, in relation to the proposed expansion.

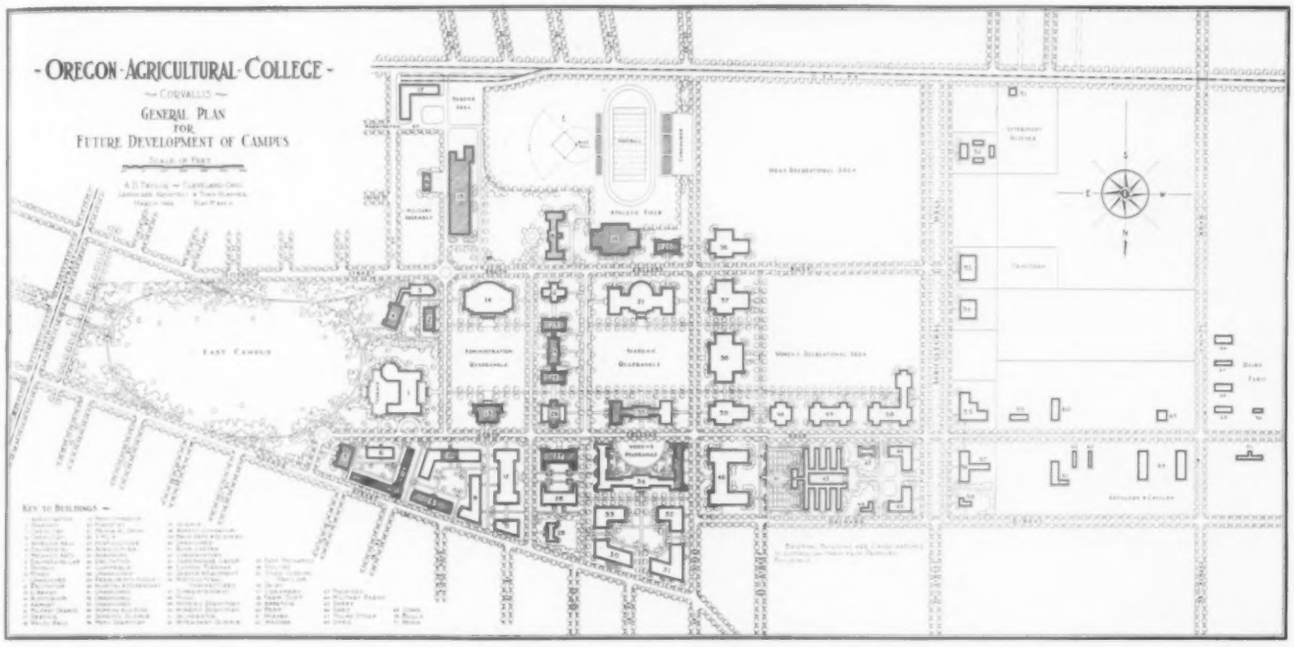
The General Plan

The ground plan will be affected by the topography, the location of existing features such as buildings, circulatory systems of expensive permanent construction, and large ground areas developed for special uses.

The character of the design is controlled by the topography of the site: whether the land is level or rolling or rugged; whether it is bare of trees or blessed with fine woodlands; whether it has the charm of



The general plan governing a twenty-five-year development program for The Northern Illinois State Teachers College was made possible only after previous preliminary studies had established the necessity for the revision of existing roadways. They were so arranged as to prevent an orderly grouping of future buildings and an economical use of the land for other facilities. The old buildings are north of the college avenue axis extended, and the new buildings are to be south of it, surrounding the quadrangle



In those institutions where the original study for future development did not provide for the unexpected increase in student enrolment with the resulting demand for new buildings, the problem of replanning has often been an expensive but, on the other hand, a necessary procedure

streams or lakes; and whether distant scenery exerts its influence on the larger aspects of the design. These qualities of nature, properly appreciated and used, are a most important factor in determining whether the design is to be formal, with a strongly marked axis governing the grouping of buildings and the relation of the larger areas to them, as in the case of a level piece of property; or whether the design shall be informal, as in rugged country, with the circulatory system fitted skilfully to the topography, and the buildings given the charm and intimacy of simple settings with the interest of curving walks and drives, sloping lawns, steps and retaining walls, and varied informal plantings. A combination of the informal and the formal can in some cases be realized when the topography is partly level and partly rolling, with intervening areas of woodland and water features, as in the plan for Northern Illinois State Teachers College, where the outdoor theater will have an informal woodland and water setting, contrasting strongly with the distant quadrangle.

The designer must have continually in mind the fitness of each unit in its relationship to other units. Whether a building, a group, an athletic field, or a campus lawn, each must definitely become a logical part of the whole composition.

The architectural style and material of existing buildings also exercise a limiting influence on the general plan where new buildings must be in close relationship to them. Where the plan may be developed on a larger scale, over an extensive area, old buildings of poor design need not have a strong influence. The future development employing a unified architecture can be carried away from the old buildings into newer and fresher surroundings without detracting from the tradition inherent in the older buildings.

The drive and walk systems should connect all portions of the campus and make all parts accessible without confusion and loss of time. They should be of ample width to meet traffic requirements. The main walks for any group of buildings will solve the problem of foot traffic logically if they are direct connections between entrances to the principal buildings. Nevertheless, the walks need not be controlled *entirely* by considerations of practical use; they are a definite part of the design, and in a formal design the main walks may be dominant lines which create a pattern in the lawn area in front of buildings.

A small quadrangle appears best as a well-shaped rectangle with a minimum number of diagonal crosswalks. Students can sometimes be directed to follow right-angle turns by low barrier planting in the corners or by a low hedge about the inside of the quadrangle. Experience proves that walks must appear to be the shortest distance between two points or at least the easiest way to follow. Walks need not replace every student path. Means can be found to compromise use with the fact that the walk system plays a prominent part in campus appearance.

Main walks will need be ample to accommodate peak loads, eight or ten feet being none too wide. Often these wide walks can be constructed sufficiently heavy to carry small service trucks to those buildings not needing a special service drive.

Roads should be kept to a minimum on the college campus. Interior drives should be avoided wherever possible. The buildings should be so arranged that they may be served by vehicular traffic from the borders of the campus. This arrangement reduces noise and confusion and eliminates traffic hazards.

The roads should be appropriate in surface treatment, like the driveways in a park or private estate. Dark-colored, neutral materials will be more suitable than white, glaring surfaces. The question often arises as to whether such roads should be curbed. If large numbers of automobiles are expected, the vertical curb may be necessary to prevent parking on the lawns. The curb will probably be made of concrete, but the principle of subordination can be maintained by making the gutter a part of the road surface, or by the use of other neutral material.

Generous provision should be made for parking facilities for automobiles. This can be accomplished with large central parking areas, or smaller ones in connection with the various buildings. A combination of the two systems seems most efficient and is less objectionable as a part of the campus scene.

The athletic requirements are an important factor in campus design, especially in institutions where emphasis is placed on mass recreation for the student body. Intramural athletics require large areas for baseball and football fields, as do also girls' hockey and archery. Fortunately, these areas are generally pleasing as large open spaces whose borders afford excellent sites for college or semi-college buildings.

The completion of the general plan is only the first step in the long-drawn-out struggle for the actual realization of an attractive and consistent growth for the institution. Appropriations and gifts are rarely adequate to carry on a continuous and progressive building program. The passing of the years, with changing conditions, inevitably demands minor alterations in the requirements of the original design, and many times these are not accomplished with a sympathetic understanding of the intent of the master plan. If possible, the execution of the working drawings and the supervision of the actual construction work as it develops over a period of years should be under the direction of the original designer.

Foliage is almost as vital to the appearance of the campus as the buildings. This is especially true of the trees. Here time is such a factor that the placing, preparation for planting, and maintenance must be taken seriously. Haphazard methods will not be successful. The landscape development of the campus or the school grounds is an important feature of the institution. Appropriate plantings, fine lawns, lovely trees, and good maintenance are an invaluable asset.

On the congested college campus, hedges are invaluable. They increase the scale of lawn areas; they confine pedestrian traffic to the walks; and in general they add an effect of neatness sufficient to justify their maintenance cost. The appearance desired is that of dignified simplicity.

Experience shows that most landscape work for educational institutions progresses rather slowly, and that the designer must keep in constant touch with the superintendent of the school system, the college president, and the board of trustees for whom general plans have been prepared, if the work is carried along consistently and without damage to the original scheme. This is largely because new officials are employed, boards change, and the enthusiasm for the plan is apt to dwindle and die out through suffering by ill-considered changes. Too much emphasis cannot be placed on the importance of faithfully following the fundamental idea of a well-conceived and officially adopted plan. A large-scale drawing of such a general plan, skilfully rendered in color, suitably framed and lighted, and hung in a conspicuously appropriate place, should serve to keep the ultimate picture before the college authorities and the student body. Over a considerable period of years it would assume historical importance and become a part of the college tradition.

The master plan of the campus can never be so complete that further consultation with the designer seems unnecessary. Each specific improvement needs detailed plans for building locations, grading, service roads, walks and planting.

Landscape Construction

General Considerations

While the first important step in the landscape development of any area is that of adopting a type of design appropriate to the development under consideration, success in the design may be completely offset by a proportionate failure in construction. No solution carried to the completion of construction in accordance with appropriate and carefully studied design can be a success unless the details of construction are given the same logical consideration that was given to the problems of design.

Those responsible for construction should remember that the desire or the need to complete a maximum amount of work within a fixed expenditure may produce results which are not of a permanent character. Construction work involving small initial cost and ab-

Shaker Heights School Group, Shaker Heights, Ohio

The developers of Shaker Heights wisely set aside in the original planning for this community adequate area on which to construct school buildings and recreational facilities

Hathaway - Brown Girls' School, Shaker Heights, Ohio

A carefully planned preparatory school unit in a high-class residential area. Note the provision for recreation fields, tennis courts, and the very complete outdoor theater located beyond the tennis courts on the area between the building and the street

The informal grouping of buildings, as seen in many of the older institutions, made necessary because of existing features of topography, makes somewhat more difficult a future expansion of the buildings, but in some locations where the topography dominates the design, such arrangement of buildings may produce a more attractive result

Photographs by courtesy of Aerial Surveys, Inc.

normal maintenance cost for repairs and replacement is in the end a much more expensive procedure than if the initial cost of construction is *somewhat increased* and the subsequent costs for repairs and replacements *very much decreased*. There are some developments in which a temporary type of construction, involving abnormal subsequent costs for maintenance and repairs, may seem necessary, especially with temporary developments whose future is somewhat uncertain. This condition does not seem to prevail in connection with improvements of educational institutions except where the uncertainty of the immediate building program within a limited period of months makes temporary construction the order of the day.

We cannot emphasize too strongly that it is not always the initial cost which should be the measure of the expenditure for any proposed improvement. So far as the facts can be determined, and especially in connection with problems of roads, walks, lawns, and plantings, the extent to which maintenance costs may be affected is an important factor in determining the justification for a greater or less initial cost.

At the present time the information available in published form covering the subject of landscape construction is very limited. It is therefore desirable that those who are responsible for programs of construction should be qualified by technical training and practical experience to perform the required work.

In an article of this kind it does not seem wise to attempt any discussion of details of construction beyond emphasizing the necessity for construction of a permanent type commensurate with the kind of development under consideration.

General Grading

There is no operation in the program of landscape construction where more money can be expended with less evidence of construction progress than in the work of grading. Appropriate grading is an important factor in any landscape design. Unfortunately, it is often assumed that the design on which an attractive setting for buildings is based is not affected beyond a certain point by a variation in surface grades. For this reason the grading work is sometimes curtailed to an unwarranted extent.

The settings of many buildings have been very seriously injured because the importance of the initial grading operation has not been fully appreciated. It is true that walks may be constructed, planting may be done and drainage may be installed subsequent to the time when the initial program of work is partly completed. Such is not the case with the work of general grading. It is seldom that any area which has been completely graded in the original program of work is re-graded, because re-grading at any later date involves a major operation at an abnormal expenditure. A procedure should therefore be adopted which includes a complete program of grading, even if there is delay of other construction work which can be completed later to better advantage.

Topsoil should be conserved by stripping and piling prior to any building operation or other construction work on roads or lawns which may destroy and "bury" this soil which is so valuable for surface use. It is also desirable that the grading plans be completed before any building construction proceeds, in order that when the excavation begins, the contractor may be directed to dispose of the surplus excavated soil in locations where a second handling of the earth is avoided. It may be necessary to handle the topsoil twice to save it, and this procedure is sometimes less expensive than to buy topsoil from outside sources; and, indeed, this procedure on some work would save large sums.

Drainage

There are a number of kinds of areas in the average institutional development in connection with which problems of drainage occur. Roads and walks, recreation areas, and turf areas developed as lawns, must be adequately drained. This is especially required where the subsoil is a heavy clay. It is not a problem where a sandy and easily drained subsoil prevails.

"Economy" in the installation of drainage is in the end one of the most expensive procedures. Inadequate drainage may become a serious problem. Much inconvenience and the expenditure of many thousands of dollars have been caused by conditions that could easily have been corrected by spending money in terms of hundreds of dollars for work in the original program to the extent necessary to avoid subsequent damage.

In every landscape construction operation provision must be made for two kinds of drainage. If surface water is not removed promptly and in the proper way, it may seriously handicap the use of recreation areas, and, during heavy storms, may cause abnormal soil erosion. Tile drains should be installed to remove soil water which saturates the subsoil and may be injurious to certain types of plant growth and may also create an undesirable soil condition.

Any main drainage lines which are required for the proper disposition of surface water and subsoil water should be installed at the time when this type of construction can be completed at minimum expense. This recommendation implies that in area where "fill" is to be made, these main drains ought to be installed before any soil is placed over the area where the drains are necessary. Also, where deep cuts are to be made, drainage should not be installed until after the cuts are effected, thus reducing the depth of the trenches and hence the cost.

The solution of drainage problems of any consequence should be assigned to a professional man technically trained in this kind of work.

Irrigation

Irrigation which involves the installation of water pipe lines is another important problem often not given adequate consideration. It must be remembered that the application of water is necessary to preserve turf and to maintain the desired moisture condition on the surface of recreation areas. Water artificially applied is of paramount importance where trees and other vegetation are growing under climatic conditions which at certain seasons make irrigation necessary.

Here again, economy in the initial construction is sometimes expensive. It is also poor economy to install water pipe lines of sizes not adequate to serve all requirements, and of a quality that does not provide for permanence. Reducing the size of water pipe lines beyond the point where there is a factor of safety in the capacity of the pipe is not good economy, because in the average construction work the cost of the pipe is only a small portion of the expenditure caused by the total installation.

Roads and Walks

The width of roads on the grounds of educational institutions—really a problem of design—should be fully adequate. The kind of traffic on any road must also be determined at an early stage in order that the construction may be of a type which will meet the requirements for heavy traffic or for light vehicular traffic, as the case may be. It is unwise to make expenditures for unnecessary construction on roads that will not be subjected to heavy-duty traffic. Failures occur in the surface of roads because of inadequate drainage of the subgrade under the road surface, inadequate depth of foundation course, and lack of thorough construction methods.

Where there is much traffic and considerable parking along the roads, it is highly desirable that a proper and substantially constructed curb be completed; otherwise the maintenance cost for the turf area along the sides of the road will be abnormal.

The important problems in the construction of walks relate to the kind of surface to be adopted, and to provisions for disposing of surface water which might create undesirable conditions during heavy rain. Gravel walks, properly subdrained, are entirely acceptable in some parts of the country where winter conditions are not severe. In general, a type of concrete construction is acceptable and proves in the end to be the most economical. It is seldom necessary to construct curbs along the sides of walks except adjacent to monumental architecture where the design of the walk is related directly to the design of the building.

Walls and Steps

Wherever any retaining walls and steps are to be constructed, it is important that these be substantially constructed and properly drained. Walls, in particular, have failed in many instances because good principles of engineering have not been followed.

Lawns

It would take too long to give in an article of this character all the information which would serve as a detailed guide for the construction of lawns. This is available in many reference libraries.

Lawns require proper subsurface and surface drainage, adequate depth of topsoil, sufficient fertilizer, and the right kind of grass seed, with subsequent maintenance, in order to be successful. There is no possibility of a good lawn if these factors are not fully considered.

It is possible to construct lawns at minimum expense and to produce an excellent turf during the first year, but if such lawns develop turf on an inadequate depth of topsoil, they prove very unsatisfactory. There is a correct way to construct any lawn; and it is wise to adopt a method of construction which is recognized as the logical procedure in the section of the country in which the work is being done. The selection of the turf should be determined by the kind of use to which the turf area is to be subjected. Definite recreation uses demand quite different types of turf from that for other areas.

Plantings

Trees, shrubs and other plants may be installed at any time without greatly increased expense. There are many reference books covering the subject of planting in all its phases, and this work should be planned only by a landscape architect who is qualified and thoroughly informed on the subject of plant materials.

Maintenance

A city school system should develop a small mobile maintenance department under a competent foreman, and in the case of a large city, advised by a qualified landscape architect to be consulted concerning minor changes and replacements that are always needed.

The problem of maintenance should be thoroughly analyzed in relation to the adoption of any design. There are plans that may seem acceptable until the maintenance cost involved is understood. It is extremely unwise to adopt a design and methods of construction which directly and to an unwarranted degree increase maintenance costs.

LANDSCAPE ARCHITECTS FOR UNIVERSITY AND SCHOOL PROJECTS

The following directory is restricted to Landscape Architects who are in independent professional practice and have actually been identified with a number of university or school projects.

Space limitations permit only three listings for each individual or firm, and preclude mentioning either the name of the architect associated or the definite character of the work undertaken for each institution. It is believed that the majority of landscape architects specializing in school and university work are here represented, and that many of the projects listed have had a considerable influence on high-grade professional practice in the planning and planting of school grounds and college campuses throughout the United States.

CALIFORNIA

Ralph D. Cornell, 3723 Wilshire Blvd., Los Angeles
Pomona College, Claremont
University of California at Los Angeles
University of Hawaii, Honolulu

Frederick N. Evans, 1341 40th St., Sacramento
Sacramento Junior College, Sacramento
Sacramento Public Schools, Sacramento
Modoc Union High School, Alturas

Howard E. Gilkey, 6311 Moraga Ave., Oakland
Mills College, Oakland
Saint Mary's College, Moraga
Modesto Junior College, Modesto

John William Gregg, University of California, Berkeley
Campus development for the University of California at Berkeley, Los Angeles, Riverside, Davis, La Jolla and U. C. Hospital, San Francisco
Mills College, Oakland

H. W. Shepherd, 821 Shattuck Ave., Berkeley
Union High School and Junior College, Marysville
Branch College of Agriculture, Davis
Round Valley Union High School, Covelo

Butler S. Sturtevant, 210 Post St., San Francisco
University of Washington, Seattle
Principia College, Elsah, Ill.
Principia School, St. Louis, Mo.

Paul G. Thiene, Pasadena
Alhambra High School, Alhambra
Santa Maria Union High School, Santa Maria
Excelsior Union High School, Norwalk

COLORADO

S. R. DeBoer, 515 E. Iliff Ave., Denver
Regis College, Denver
Boulder High School, Boulder
Wyoming State Training School, Lander

CONNECTICUT

Thomas H. Desmond & Associates, Inc., Simsbury
U. S. Coast Guard Academy, New London
Connecticut State College, Storrs
Simsbury High School, Simsbury

Joseph F. Whitney, Middlesex Rd., Darien
Engineering Court, University of Cincinnati, Ohio
School Group, Falmouth, Mass.
Grade and High School, South Dennis, Mass.

FLORIDA

Herbert L. Flint, Post Office Bldg., Winter Park
Mount Union College, Alliance, Ohio
Newport School, Ironwood, Mich.
Rollins College, Winter Park

ILLINOIS

Chance S. Hill, 1333 Maple Ave., Downers Grove
North Central College, Naperville
Northern Illinois State Teachers College, DeKalb
Main Township High School, Des Plaines

Robert Bruce Harris, 750 North Michigan Ave., Chicago
Niles Twp. Community High School, Niles Center
Marshfield Senior High School, Marshfield, Wis.
School District No. 69, Niles Center

Simonds, West & Blair, 1101 Buena Ave., Chicago
Monticello College, Godfrey
Chicago Latin School, Chicago
Country Day School, Winnetka

F. A. Cushing Smith & Associates, 333 North Michigan Ave., Chicago
St. Agnes School, Albany, N. Y.
Rockford College, Rockford
Medical and Dental College, University of Illinois, Chicago

INDIANA

Donald B. Johnston, Architects and Builders Bldg., Indianapolis
Miami University, Oxford, Ohio
School, Richmond
Earlham College, Richmond

Lawrence V. Sheridan, Brendonwood, Indianapolis
Purdue University, Lafayette
St. Mary of the Woods Academy, Terre Haute
Shortridge High School, Indianapolis

IOWA

P. H. Elwood, Landscape Studio, Ames
St. Amilian's School, Milwaukee, Wis.
Iowa State College, Ames
School for Deaf, Council Bluffs

MARYLAND

Joseph C. Gardner, 7110 Clarenden Rd., Bethesda
Woodrow Wilson High School, Washington, D. C.
Eckington School and Recreation Center, Washington, D. C.
John Eaton Elementary School, Washington, D. C.

Irving W. Payne, 4017 Leland St., Chevy Chase
Georgetown Preparatory School, Garrett Park
The Miss Madeira School for Girls, Greenway, Va.
Lanham Grade School, Lanham

MASSACHUSETTS

Robert Washburn Beal, 185 Devonshire St., Boston
Eldon Keith Field, High School, Brockton
Bowdoin College, Bowdoin Athletic Field, Brunswick, Maine
Wellesley High School & Hunnewell Playground, Wellesley

Franklin Brett, Franklin St., Duxbury
Marshfield High School, Marshfield
Weston High School, Weston
Duxbury High School, Duxbury

Herbert J. Kellaway, 12 West St., Boston
Andover Newton Theological School, Newton Center
Middlebury College, Middlebury, Vt.
Oak Hill School, Newton

Hallam L. Movius, 115 Newbury St., Boston
Bradford Junior College, Bradford
Bowdoin College, Brunswick, Me.
University of Buffalo, Buffalo, N. Y.

John Nolen, Harvard Square, Cambridge
Babson Institute, Wellesley
Queens College, Charlotte, N. C.
University of Wisconsin, Madison, Wis.

Olmsted Brothers, 99 Warren St., Brookline
Phillips Academy, Andover
Grove City College, Grove City, Pa.
Duke University, Durham, N. C.

Arthur A. Shurcliff, 11 Beacon St., Boston
Wellesley College, Wellesley
St. Paul's School, Concord, N. H.
Amherst College, Amherst

MICHIGAN

T. Glenn Phillips, Charlevoix Bldg., Detroit
Michigan State College, East Lansing
Sacred Heart Seminary, Detroit
Michigan College of Mining and Technology, Houghton
H. O. Whittemore, 1920 Norway Rd., Ann Arbor
Nichols Arboretum, University of Michigan, Ann Arbor
Ann Arbor Public Schools
Hartland Consolidated School, Hartland
Raymond Hill Wilcox, Union Guardian Bldg., Detroit
Duns Scotus College, Detroit
Starr Commonwealth for Boys, Albion
Grosse Pointe High School, Grosse Pointe

MINNESOTA

Hugh Vincent Feehan, 1004 Marquette Ave., Minneapolis
Muldoon High School, Rockford, Ill.
St. Thomas College, St. Paul
College of St. Scholastica, Duluth
Morell & Nichols, Inc., 1200 Second Ave., South, Minneapolis
University of Minnesota, Minneapolis
Washington State College, Pullman
Carleton College, Northfield

MISSOURI

Hare & Hare, 114 W. 10th St., Kansas City
University of Texas, Austin
Wyandotte High School, Kansas City, Kans.
63 Schools, Fort Worth, Texas
John Noyes, Railway Exchange Bldg., St. Louis
Southeast Missouri State Teachers College, Cape Girardeau
Ladue School, Ladue
Webster Groves Schools, Webster Groves

NEW JERSEY

Brinley & Holbrook, South St., Morristown
State Teachers College, Hillwood
South Orange High School, Maplewood
Jersey City Normal School, Jersey City
Michael M. Burris, 485 Engle St., Englewood
Bergen Junior College, Teaneck
High School and 6 Grade Schools, Teaneck
Junior High School and 2 Grade Schools, Bergenfield

NEW YORK

Briggs & Stelling, 10 E. 40th St., New York (also Charleston, S. C.)
Junior High Schools, Newburgh
Athletic and Recreation Grounds, Bronxville
Hunter-Tannersville Central Schools, Greene County
A. F. Brinckerhoff, 101 Park Ave., New York
Connecticut College, New London
Trinity College, Hartford, Conn.
Connecticut School for Mental Defectives, Southbury
Laurie D. Cox, 136 Kensington Place, Syracuse
Dundee Central School, Dundee
Hudson High School, Hudson
Union Free School, Dist. 7, Hartsdale
Alling S. DeForest, 16 Fair Place, Rochester
High School and North Street School, Geneva
Villa Chantill, Rock Island, Ill.
Colgate-Rochester Divinity School, Rochester
Byrant Fleming, Wyoming
Cornell University, Ithaca
Toronto University, Toronto, Canada
District School, Wyoming
Francis Hastings Gott Associates, 920 Merchants Rd., Rochester
Ovid Central School, Ovid
Port Byron School, Port Byron
East Bloomfield School, East Bloomfield
William E. Harries, 110 Franklin St., Buffalo
Central School, Elba
Fourth Ward School, Lackawanna
Central School, Alexander
Roeder J. Kinkel Associates, 438 Delaware Ave., Buffalo
Evangelical Training School, Dunkirk
Batavia High School, Batavia
Alfred University, Alfred
Charles Downing Lay, 101 Park Ave., New York
Free Academy, Newburgh
Union College, Schenectady
New York State Normal Training School, Cortland
H. B. Littlefield, "Little Field," North White Plains
Central High School, Hancock
High School and Stadium, White Plains
Battle Hill School, White Plains
Charles N. Lowrie, 101 Park Ave., New York
Yale University Athletic Fields, New Haven, Conn.
Lawrenceville School, Lawrenceville, N. J.
Montclair Academy, Montclair, N. J.
William Pitkin, Jr., and Seward H. Mott, Inc., 82 St. Paul St., Rochester
University of Michigan, Ann Arbor
Kent State University, Kent, Ohio
University of Rochester, Rochester
Richard Schermerhorn, Jr., 342 Madison Ave., New York
St. Anthony's Seminary, Catskill
Albany Academy, Albany
Rensselaer Polytechnic Institute, Troy
Jacob John Spoon, 128 Greenacres Ave., White Plains
Academy of St. Joseph-in-the-Pines, Brentwood
Penn. Township School Dist. High School Grounds, Bernville, Pa.
Central School District No. 1, Pine Plains
Vitale & Geiffert-Gilmore D. Clarke, 101 Park Ave., New York
University of Illinois, Urbana
Hunter College, New York
New Jersey College for Women, New Brunswick

NORTH CAROLINA

E. S. Draper Associates, 2038 Beverley Dr., Charlotte
Winthrop College, State College for Women, Rock Hill, S. C.
Lanier Memorial School, Langdale, Ala.
Agnes Scott College, Decatur, Ga.

OHIO

Alexander & Strong, 4500 Euclid Ave., Cleveland
Lake Erie College, Painesville
University School, Cleveland
Mentor Village School, Mentor
A. D. Taylor, 4614 Prospect Ave., Cleveland
Oregon State University, Corvallis
Carnegie Institute of Technology, Pittsburgh, Pa.
Notre Dame College, Cleveland

PENNSYLVANIA

Wheelwright & Stevenson, 225 S. 15th St., Philadelphia
The Gunnery School, Washington, Conn.
St. Andrews School, Middletown, Del.
Muhlenberg College, Allentown

VIRGINIA

Albert A. Farnham, 1240 White Oak Rd., Roanoke
Hollins College, Hollins
Virginia Polytechnic Institute, Blacksburg
Warren County High School, Front Royal
Charles F. Gillette, 105 E. Cary St., Richmond
William and Mary College, Williamsburg
Virginia State College for Negroes, Petersburg
Bennett College, Greensboro, N. C.

WISCONSIN

Phelps Wyman, 759 N. Milwaukee St., Milwaukee
State Teachers College, Milwaukee
State Industrial School for Girls, Oregon
Lincoln High School, Wisconsin Rapids

CANADA

Arthur M. Kruse, 50 High Park Blvd., Toronto, Ontario
The Boys' Training School, Bowmanville, Ontario
Woodstock College, Woodstock, Ontario
Belleville Institution for the Deaf, Belleville, Ontario

STUMPP & WALTER CO.

Seeds — Bulbs — Plants — Equipment and Supplies

132-138 Church Street, New York City

Branch Stores in:
WHITE PLAINS, N. Y.
STAMFORD, CONN.

Stumpp & Walter Co

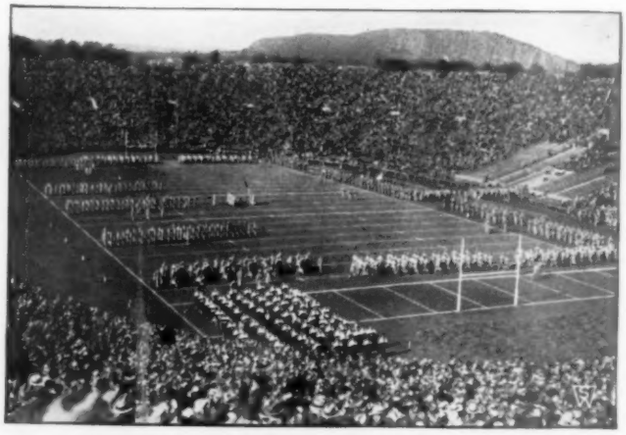
Branch Stores in:
NEWARK, N. J.
ENGLEWOOD, N. J.
HEMPSTEAD, L. I.

THIS TURF BOOK
FREE
ON REQUEST

"GOLF TURF"

A valuable reference book on the making and maintaining of Turf on Golf Courses, Polo Fields, Tennis Courts, Etc.

Copy Will Be Sent Free on Request



The Yale Bowl at New Haven, Conn. Grass Seed for Yale Bowl, as well as for Yale Golf Course, Polo Field and Football Field, also for Stadium at West Point, supplied by the Stumpp & Walter Co.

GRASS SEED OF KNOWN QUALITY

FOR GOLF COURSES, TENNIS COURTS, POLO FIELDS, ATHLETIC FIELDS, AIRPORTS, CAMPUS, LAWNS, ETC.

All our seeds are of the highest quality, botanically true to name and are cleaned and re-cleaned, special care being given to the elimination of weed seeds.

We are always glad to advise in regard to formulas suited to soil and climatic conditions, treatment of soil, fertilizing, etc.

EQUIPMENT AND SUPPLIES

We are also agents and dealers in Tractors, Mowers, Rotary Soil Screens, Implements, Fertilizers, Insecticides and Sundry Equipment and Supplies.

Complete Catalog on Request

HIGH QUALITY BULBS

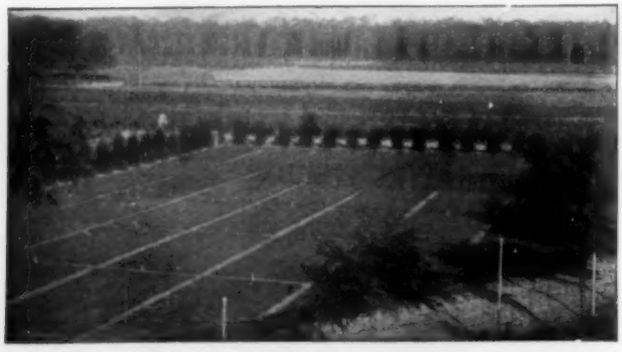
We are one of the largest growers and importers of American, Dutch, French and other imported Bulbs for discriminating flower lovers in the United States.

FLOWER SEEDS

All our seeds are of the highest quality and are carefully examined and tested at our trial grounds. We offer only those of superior strains and finest types, and a complete list of new introductions.

VEGETABLE SEEDS

All our seeds are of the highest quality and we list only such sorts which from tests at our trial grounds we have found to be of superior merit and which we can recommend for both the market and home garden.



Experimental Turf Plots at the Stumpp & Walter Company's testing grounds at Farmingdale, Long Island. Here research work has been carried out with grass varieties, plant foods, mowers and rollers

"SEED ANNUAL"

A complete Catalog of Seeds, Bulbs, Plants and Horticultural Supplies. It contains 24 pages of illustrations in natural colors.

Copy Will Be Sent on Request

THE COLE NURSERY COMPANY

Introducers of Truehedge Columnberry

ESTABLISHED 1881 — Plant Patent No. 110 — 600 ACRES

Painesville, Ohio

Truehedge Columnberry is being used in huge quantities at the World's Fair in New York, — one individual order consisting of more than 10,000 plants

BEAUTIFY YOUR SCHOOL GROUNDS WITH TRUEHEDGE COLUMNBERRY

HERE, at last, is a hedge as beautiful as boxwood, which it closely resembles, and as hardy as the common Japanese barberry. First introduced in July, 1934, it has been much sought after by school and college executives, as well as park superintendents, landscape architects and others interested in beautifying public grounds or private estates.

Truehedge Columnberry is as beautiful as boxwood, considerably lower in price, and infinitely more hardy. It is particularly welcomed in the north because it withstands severe weather conditions so admirably. It rapidly attains mature size, forming a dense hedge of glossy, deep green foliage. It may be quickly trimmed to make a formal hedge, or left untrimmed to make an unsurpassed semi-formal hedge. The density of this plant, as compared with common barberry, is almost unbelievable.

These actual photographs picture the unsurpassed beauty of Truehedge as developed by Mother Nature, untainted and unchanged by human hands. Individual trimmed and untrimmed specimens for accent and other spectacular purposes are easily attained. Individual columns, boxes, ovals, fans, and artistic topiary designs may be quickly created.

New **Truehedge Columnberry** **Common Barberry**

Our free illustrated booklet describes in words and pictures the varied uses of Truehedge and also tells of the gratifying results obtained by many of the best Parks and Cemeteries of our country.

THE COLE NURSERY COMPANY grows a complete line of

"Everything That's Good and Hardy"

Shrubs, Shade and Ornamental Trees, Roses, Vines, Fruits and Perennials

Wholesale Catalogue on Request.
Inquiries appreciated.

DISTRIBUTORS

Plants are available at any of the following nurseries, or may be ordered direct from the Cole Nursery Company:

Adams Nursery, Inc., Springfield, Mass.
Bay State Nurseries, North Abington, Mass.
Fairview Evergreen Nurseries, Fairview, Pa.
Charles Fiore Nurseries, Prairie View, Ill.
Jackson & Perkins Co., Newark, N. Y.
Lester C. Lovett, Little Silver, N. J.
Henry A. Dreer, Inc., Philadelphia, Pa.
I. E. Ilgenfritz' Sons Co., Monroe, Mich.
R. M. Kellogg Company, Three Rivers, Mich.
Mount Arbor Nurseries, Shenandoah, Iowa
Shenandoah Nurseries, Shenandoah, Iowa
E. D. Smith & Sons, Ltd., Winona, Ontario
Storrs & Harrison Co., Painesville, Ohio
Vaughan's Seed Store, Western Springs, Ill.
Wayside Gardens Co., Mentor, Ohio

LARGE ILLUSTRATED BOOKLET DEPICTING TRUEHEDGE COLUMNBERRY SENT FREE ON REQUEST

Picture of TRUEHEDGE COLUMNBERRY taken immediately after first trimming, which consumed about thirty minutes per row with hedge shears; plants three years old; June, 1935

GRAVELY MANUFACTURING COMPANY

Box 801, Dunbar, W. Va.

Schools throughout the country recognize the distinct advantage of the GRAVELY . . . ONE Machine that ALONE solves so many upkeep problems.

You buy ONE sturdy 5 H. P. Tractor . . . Then, change Power Attachments according to the job. With the GRAVELY One Man Does EVERYTHING . . .

A 30" Power Driven Rotary Mower for the Lawns. (Power Driven Gang Units and Riding Sulky available for the larger areas.)

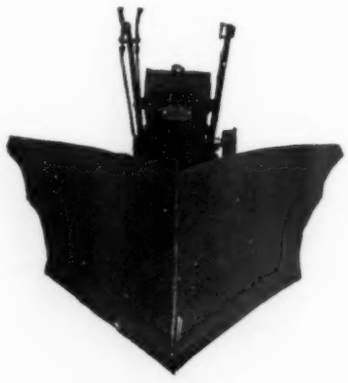
A 42" Power Sickle Mower for the Rough Spots or Athletic Fields.

A Power Sprayer . . . A Power Pump . . . Small Cart for odd Jobs of Hauling . . . And, both a V and a Patented Reversible Blade Type Plow for Snow Removal.

Learn more about a machine that for 18 years has been improving the appearances of Schools while at the same time reducing upkeep cost.

Exclusive GRAVELY Features:

5 H. P. Motor . . . 2 Forward Speeds and Reverse . . . No Chains, direct Gear Drive . . . One Spot to Lubricate both Motor and Transmission . . . Automotive type Differential.



"WHEN IT RAINS, IT POURS"
But, When It Snows . . .

You want to be prepared to clear it from the sidewalks. Do this quick and you will be praised.

Be slow, and it's just the opposite.

The modern GRAVELY Tractor with the Snow Plow is a "natural" for that kind of work.

YOU CAN DO IT *ALL* WITH A
GRAVELY
TRACTOR-MOWER

Ask for Catalog entitled:
"MY IDEA OF A PRACTICAL POWER MOWER"

COLDWELL LAWN MOWER COMPANY

Manufacturers of

Hand, Horse and Motor Lawn Mowers

Newburgh, N. Y.

SINCE 1867

COLDWELL POWER MOWERS AND HAND MOWERS

MODELS FOR EVERY TYPE LAWN AND EVERY PURPOSE

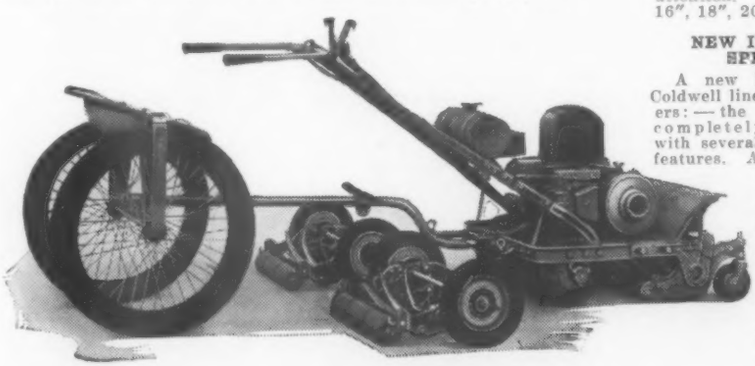
Educational directors, Superintendents of Schools and Universities and others having large lawns to maintain find that the Coldwell line of mowers covers every possible requirement and that the operating performance of each and every one of the many models leaves nothing to be desired.

For more than seventy years—ever since 1867—the Coldwell Lawn Mower Company has been studying lawn mower problems in all their aspects, and there is now available a mower that exactly fits each requirement, whether for large-scale mowing or for trimming neatly close up to a wall, walk or hedge.

In 1897 Coldwell built the first power lawn mower in America, and now every model represents the latest in manufacture, is constructed by experienced workmen and exhaustively field tested. Coldwell power mowers are not for the purpose of merely cutting grass at low operating cost. They are built to do their great share in the maintaining of a beautiful lawn. Mowing, rolling and trimming are accomplished at a minimum of time and expense. Anyone can operate them because of their simplicity of design and ease of operation.

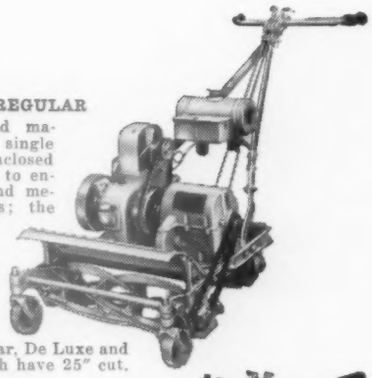
COLDWELL SUPER TWIN MOWERS

For large-scale work, use one of the Coldwell Super Twin Mowers, with heavy duty gang units. Illustrated below is the Super L Twin, Rubber Roller Model, with Riding Sulky and pneumatic tires on the gang units, 60″ cut. Coldwell Super Twin Models house an abundance of power and are designed for large areas. Large widths of cut are made by the addition of extra cutting units. There is plenty of power for grades and when the Sulky is attached the operator can ride it. As a single unit it can be used for trimming along driveways and walks, around trees and flower-beds. The gang mower cutting units contain steel cut gears enclosed in dirt-proof housing, the wheels run on roller bearings and they are equipped with heavy metal wheels or pneumatic tired wheels. The units are equipped either with sectional iron or rubber covered guard rollers. They are designed for heavy duty work, as their name signifies. Other models are Super L Twin with four gangs, 94″, Super Twin Thirty with two gangs, 65″, Super Twin Thirty with four gangs, 100″.



COLDWELL CUB REGULAR

A first-rate all-'round machine with three speeds; single cylinder, water cooled enclosed motor; oil pump forces oil to engine bearings, cylinders and mechanically operated valves; the ignition, a high tension magneto specially waterproofed enabling motor to start readily; automotive type carburetor conveniently placed on motor. Width of cut 21″. Other models similar to Cub Regular are L Junior Regular, De Luxe and Rubber Roller Models which have 25″ cut.

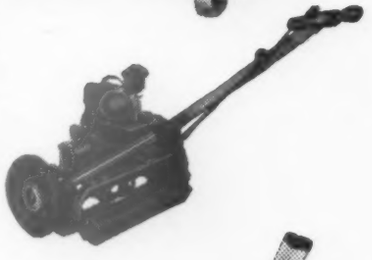


COLDWELL BEAVER

A streamlined, all-around utility power roller mower priced low, for use on smaller estates. Mows, rolls and trims to perfection at low operating expense. Width of cut 21″. Model H Briggs & Stratton motor. 6″ diameter, 5-bladed revolving cutter with cold rolled steel center shaft mounted on Precision Ball Bearings. Expressly built to fill the need for a low-cost power roller mower of high efficiency.

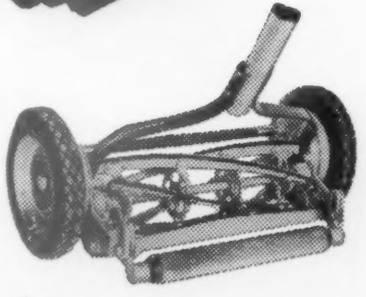
COLDWELL BADGER

An amazing new small power mower built to meet the demand for an extremely low-priced machine for use on lawns of from ¼ to 4 acres. Mows, rolls and trims. Simply constructed; easy to operate. Uses only ¾ gal. fuel per 8 hours. Width of cut 19″. Cuts ½ to 1¼ acres per day. Recommended for trimming in parks, cemeteries and around schools and campuses. A utility machine which ideally supplements larger equipment.



AMBASSADOR DE LUXE

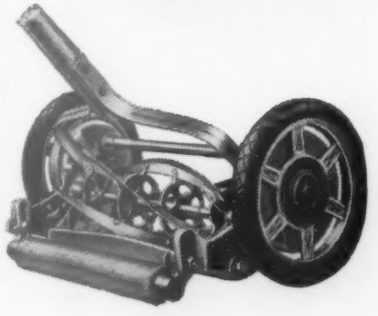
A quality hand mower of medium weight, equipped with Goodyear pneumatic tires. Useful as a general all-purpose machine for well-kept lawns; handy on both small grass plots and large areas requiring minimum attention. Width of cut 16″, 18″, 20″.



NEW IMPERIAL SPECIAL

A new leader in the Coldwell line of hand mowers:—the old Imperial completely modernized, with several new, unusual features. A machine that will really last a lifetime. Width of cut 16″, 18″ or 20″. Equipped with steel flanges.

Grass catchers can be furnished for all Coldwell Power Mowers.



JACOBSEN MANUFACTURING CO.

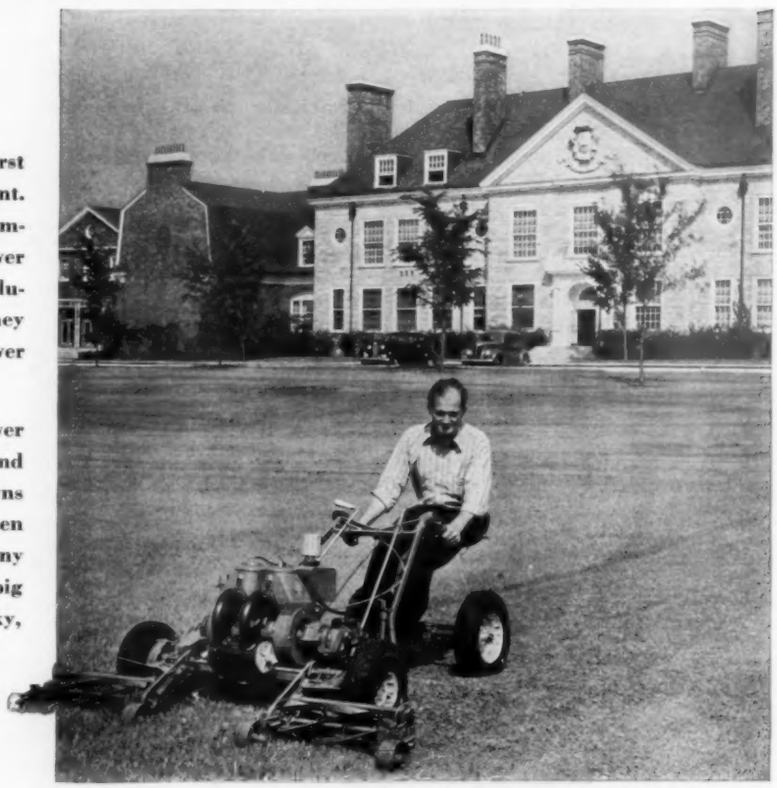
740 Washington Ave., Racine, Wisconsin

FACTORY BRANCH: 101 Park Ave., New York

POWER MOWERS FOR LAWNS OF EVERY SIZE

SCHOOLS AND UNIVERSITIES are often first to test and prove the value of new equipment. Back in 1921, when Jacobsen Manufacturing Company introduced its first general purpose power lawn mower, some of the earliest users were educational institutions, and we realize that they helped make us America's foremost Power Mower specialists.

Great strides have been made in power mower construction since that day and now schools and universities throughout the world keep their lawns beautiful with various types and sizes of Jacobsen Power Lawn Mowers. The line now includes many models, from small inexpensive types to the big twin-motor models with side units and riding sulky, and tractor gang mowers. The high standard of quality always found in a Jacobsen Mower assures the owner of the most satisfactory service for the greatest number of years and at the lowest cost.



"Twin" Mower with side units at Shields Township School, Lake Forest, Ill.

The Jacobsen "4-ACRE" Power Mower

This veteran of the Jacobsen line is recognized as the standard of power mower quality everywhere. It has all-gear drive, auto-type differential, separate reel and traction clutches, abundant power, short turning ability, easy control and many other advantages. Made with 24 and 30 inch cutting reels. Power-driven side unit available which increases the cutting width by 20 inches.

The Jacobsen "TWIN" Power Mower

This mower is built along the same general lines as the famous "4-Acre" Mower, but has twin motor. It has power to pull the riding sulky and propel two power-driven side units, making the total cutting width 68 inches. Capable of cutting 18 to 20 acres per day.

Jacobsen Gang Mowers

This mower has proved exceptional efficiency on Fairways and other wide expanses of lawns. It has many exclusive Jacobsen features that have won distinction for it. Available in 3, 5 or 7 gang units, with or without tractor. Write for full details.

Jacobsen "Lawn King" Power Mower

This mower, made with 24-inch cutting reel is suitable for schools with small lawn areas, desiring an efficient but moderate priced mower.

Write for descriptive catalogue of Jacobsen Mowers; wheel and roller drive; walking and riding types. We will gladly survey your problem and estimate the savings you can make with Jacobsen Power Mowers. An inquiry will not obligate you.

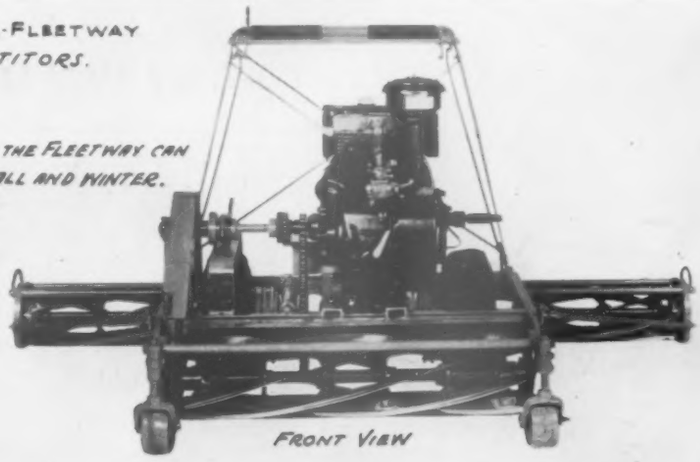
THE MOTO-MOWER COMPANY

Main Office: 4600 Woodward Avenue, Detroit, Michigan

THESE FEATURES ARE WHAT PUT MOTO-MOWER-FLEETWAY IN A CLASS BY ITSELF - IT HAS NO COMPETITORS.

WITH THESE ATTACHMENTS THE FLEETWAY CAN BE USED SPRING, SUMMER, FALL AND WINTER.

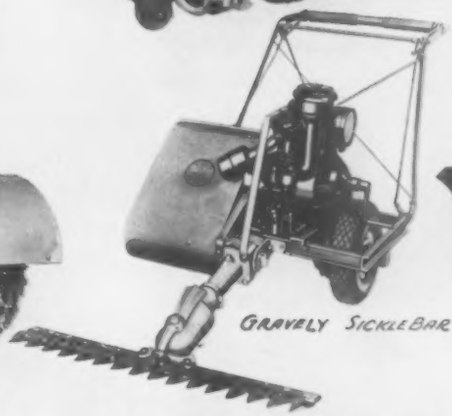
TRAILERS RAISED



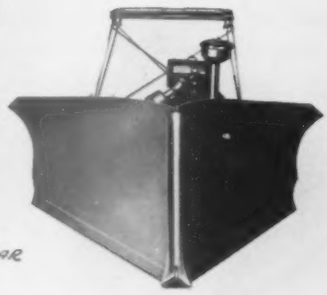
FRONT VIEW

WITH LAWN SWEEPER

FORWARD ROTARY SWEEPER



GRAVELY SICKLE BAR



SNOW PLOW

SPRINGFIELD LAWN SWEEPERS

3 MODELS

28" HAND OPERATED

36" TRAILER TYPE

36" POWER TYPE

FOR BETTER PARKS, GOLF COURSES, CEMETERIES, INSTITUTIONS OR OTHER PLACES WHERE THE BEAUTY OF GRASS IS DESIRABLE.

JUST ANOTHER REASON WHY YOU SHOULD BUY MOTO-MOWER PRODUCTS

Moto Mower Co.
DETROIT MICHIGAN

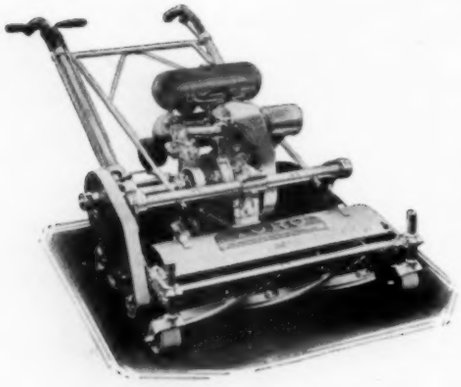
TORO MANUFACTURING CORPORATION

America's Largest Builders of Power Grass-Cutting Machinery

3042–3206 Snelling Ave., Minneapolis, Minn.

TRACTORS — POWER LAWN MOWERS — ROLLERS

Write for Complete Catalog



TORO PARK SPECIAL

The Park Special is a thoroughly dependable mower with a cutting swath of 30 inches and a capacity of four to six acres per day. Powered with the Toro Hi-Duty three horsepower, four-cycle motor, it will deliver faithful service over a long period of years. Will climb steep hills and cut the heaviest turf. Will handle diskers, drag mats, sickle bars, renovators, gang mowers and other attachments.

SNOW PLOW FOR PARK SPECIAL

Now You Can Use Your Mower Summer and Winter

This new Toro plow is of the moldboard single-blade type, fifty-four inches wide and twenty-one inches high. It is easily attached and detached by simply removing the cutting unit and bolting the plow directly to the chassis side members. The whole job can be done in 15 minutes.

The plow is held at the proper angle by means of a pull-out pivot pin. When retracing the same path, as a return trip on a sidewalk, the plow can be pivoted or swung from right to left and pinned in proper position.

Doubles the Usefulness of Your Toro Power Mower.

TORO IMPROVED POWER ROLLER

Eliminates tedious hand rolling for tennis courts and athletic fields. Rolling width 30 inches. Weighs with operator 1250 lbs. Speed up to 3½ M. P. H. Forward and reverse gear obviates constant turning. Toro standard 4-cycle, air-cooled motor . . . 3 H. P.

WHIRLWIND LAWN MOWERS SALES CORP.

Manufacturers of

Whirlwind Power Lawn Mowers

WHIRLWIND Milwaukee, Wisconsin WHIRLWIND

A NEW PRINCIPLE IN LAWN MOWING

By combining the practicality and simplicity of the old-fashioned scythe with two fundamental principles that keep giant planes aloft, Whirlwind Lawn Mowers Sales Corporation is revolutionizing the power lawn mower industry.

The Whirlwind Power Lawn Mower's cutter knife (see right) is propeller-like in action, revolving horizontally on an axis. Each end of this blade, revolving at tremendous speed, carries a 3½ inch cutter knife placed at such an angle that all cutting is done by scythe-action. On the back of each of these knives is an uptilted "lifting" blade. As the cutters revolve these uptilted "tails" create a suction that gives surrounding air a "lift."

The popular Model SP Whirlwind has come into wide usage on school grounds all over the United States

This suction pulls all short, flat-lying, stray grasses into the path of the flying blades—"holds" them for cutting. This scythe-suction combination, an exclusive Whirlwind feature, makes it possible to trim directly up to any obstacle.

A COMPLETE MOWING JOB IN ONE OPERATION

The economies effected by being able to perfectly cut and to completely trim a lawn in one operation and with **one** machine have made the Whirlwind Power Lawn Mower particularly adaptable to school lawns where flower beds, hedges, shrubbery, and trees make mowing increasingly expensive. Whirlwind's ability to trim directly up to any obstacle means that time ordinarily wasted in clipping with sickle or shears is eliminated. The cutter blade is adjustable by spacers so that grass can be cut from grass roots to a height of 3½ inches. Too, the Whirlwind efficiently cuts short, fine grass or tallest weeds without aid of special attachments. All clippings are completely pulverized and they settle back into the root-bed as fertilizer.

ECONOMY OF MAINTENANCE

The simplicity of Whirlwind's mechanism largely nullifies the cost of maintenance. Elimination of reel and bottom blade makes sharpening a minute's job of easy hand filing by the operator. The application of power to propel the Whirlwind has been accomplished in a simple, direct way that eliminates trouble-creating mechanism.

View of uptilted mower, showing the simplest cutting device ever to cut grass efficiently

MODEL SIZES MEET SCHOOL LAWN NEEDS

There is a Whirlwind Power Lawn Mower to fit the need of every school lawn. Both power driven and hand pushed models are available. Whirlwinds are equipped with Briggs & Stratton motors, industrial pneumatic tires, and alemite grease fittings.

Whirlwind cuts right up to flower beds, hedges, trees. It cuts and trims in one operation

WRITE FOR NEW FOLDER

A new folder, containing a full description of all Whirlwind models, will be of great interest to you. Write the Whirlwind Lawn Mowers Sales Corp., Milwaukee, Wisconsin.

THE COLUMBIA ALKALI CORPORATION

Manufacturers of Columbia Calcium Chloride, Columbia Alkalies

Factories, General Offices: Barberton, Ohio

BRANCH SALES OFFICES

30 Rockefeller Plaza, New York City
Carew Tower, Cincinnati
2204 Tribune Tower Bldg., Chicago
1106 Central Industrial Ave., St. Louis
616 S. Third St., Minneapolis
Grant Bldg., Pittsburgh
Santa Fe Terminal Bldg., Dallas
300-316 Babcock St., Boston
3849 Hamilton Ave., Cleveland
3034 N. 16th St., Philadelphia

USE

COLUMBIA CALCIUM CHLORIDE

TO LAY DUST ON

SCHOOL AND UNIVERSITY DRIVEWAYS
PARKING GROUNDS, PLAYGROUNDS
TENNIS COURTS, BASEBALL DIAMONDS

The dust nuisance is both annoying and unhealthful. Cars passing on school and university driveways and nearby highways stir up clouds of dust that pollute the air with countless germs. During the dry season, school rooms, desks and equipment are covered with successive layers of unsanitary dust not only annoying to those who believe in cleanliness but a factor that adds to the janitor service in keeping school rooms and buildings clean.

It is now common practice to spread Columbia Calcium Chloride flakes over the dusty road and playground surfaces. These flakes soon draw moisture from the air and keep the surfaces moist, compact, and dustless. Ordinarily, two applications, six or eight weeks apart, at the beginning of the dust season will make the surfaces compact and dustless all season long. To estimate your requirements, plan on using one pound of Columbia Calcium Chloride per square yard of surface.

USE

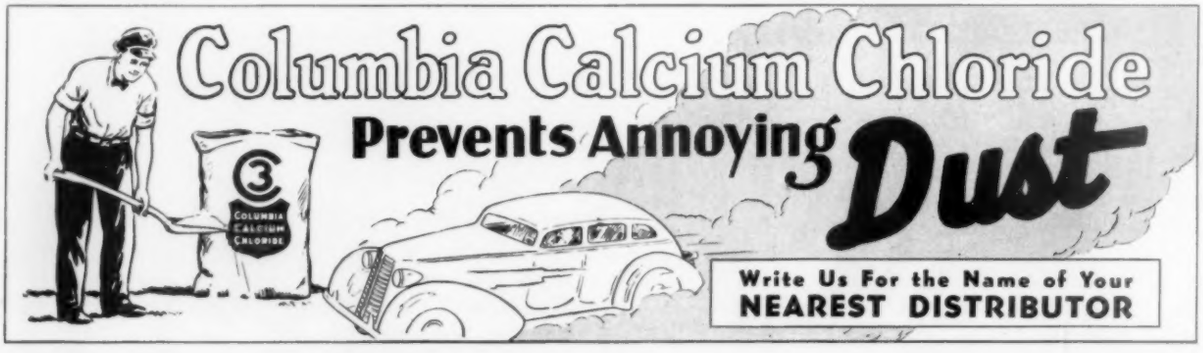
COLUMBIA CALCIUM CHLORIDE

TO MELT ICE ON

SLIPPERY DRIVEWAYS, SIDEWALKS, AND STEPS

Calcium Chloride flakes spread on these slippery surfaces will melt the ice quickly thus removing the cause of many car skidding accidents and personal injuries as a result of falling on slippery ice. Columbia Calcium Chloride is effective in temperatures below zero. (Other chemicals become inactive around zero.) Columbia Calcium Chloride comes in 100 lb. moisture proof paper bags and in 400 lb. steel drums. Write us for prices and the name of your nearest distributor.

Many thousand tons of Columbia Calcium Chloride are used by highway departments for dust laying and road soil stabilization



SOCONY-VACUUM OIL COMPANY, INC.

STANDARD OIL OF NEW YORK DIVISION

26 Broadway, New York, N. Y.

The De Veaux School for Boys, Niagara Falls, N. Y.
Road Construction with Socony Asphalt Products

SOCONY ASPHALT BINDERS
"B" AND "C"
SOCONY COLD PATCH ASPHALT

STANDARD BRAND SOCONY ASPHALTS AND ROAD OILS

SOCONY LIQUID ASPHALT
SOCONY ASPHALT PAVING FILLERS

Asphalt Macadam Roads

Asphalt Macadam Roads built by the Penetration Method are recognized by leading engineers as one of the most durable types of construction, being economical in cost and maintenance. This type presents a non-skid, all-weather surface, ideal for school and university grounds.

Socony Asphalt Binders "B" and "C" are widely used for such construction, in amounts varying from 2 to 3 gallons per square yard, being applied at temperatures ranging from 275 degrees to 350 degrees.

For Surface Treating of Gravel Roads and Paths

For economical treatment of dirt and gravel roads and paths, where it is desired to lay the dust and protect the surface with an Asphaltic mat, Socony Liquid Asphalts are produced in different grades to meet particular requirements. Socony Liquid Asphalts are usually applied in amounts varying from ¼- to ½-gallon per square yard and require a cover of sharp sand or clean gravel.

For Repairing Road and Path Surfaces

Socony Cold Patch Asphalt is an ideal patching material for repairing holes, ruts and depressions in all types of bituminous road surfaces. It is equally effective for restoring worn, uneven surfaces of brick and wood block pavements.

For each cubic yard of ½-inch to ¾-inch dry stone, we recommend the use of about 16 gallons of Socony Cold Patch Asphalt. Socony Cold Patch Asphalt is used without heating and is workable the year round.

For Filling Joints of Brick and Concrete Pavements

Socony Asphalt Paving Fillers (Standard Brand) for filling joints of brick, granite and concrete pavements are especially refined Asphalts of high melting point. We also supply Asphalt Fillers containing mineral matter. Either of these grades is poured or squeegeed to produce a rigid pavement.

ANCHOR POST FENCE COMPANY

Complete Line of Fences and Playground Equipment

Baltimore, Md.

SALES OFFICES IN PRINCIPAL CITIES

ANCHOR FENCES FOR SCHOOLS AND SCHOOL PLAYGROUNDS

The Anchor Post Fence Company has been serving public schools and colleges, municipalities and industrial plants with fencing and playground equipment to suit their various requirements for nearly half a century.

Anchor Chain Link Fences

Makers of America's first chain link fence, the Anchor Post Fence Company today manufactures a complete line, and will be glad to supply any interested school executive or architect with a copy of our Chain Link Fence Catalog containing full information about the four exclusive features which make an Anchor Chain Link Fence exceptionally attractive and durable. **Ask for Catalog No. 100.**

Anchor-Weld Iron Fences and Gates

Through the exclusive Anchor-Weld method of construction, the Anchor Post Fence Company is able to manufacture iron fences and gates which equal in appearance many expensive hand-wrought products. Many schools throughout the country are today justly proud of their beautiful Anchor-Weld Ornamental Iron Fences and Gates. Some of these are to be found illustrated in our **Catalog No. 83.**

Anchor Drive-Anchorage

Anchor's Four Exclusive Features

1. **ANCHOR-WELD WIRE GATE**—built with a frame of square tubular steel—arc-welded at the corners. The square shape of the heavy steel tubing, together with the welding of the corners, provides a framework of such exceptional strength that no re-enforcing diagonal braces are needed. We claim that this is the strongest and most attractive wire gate made.

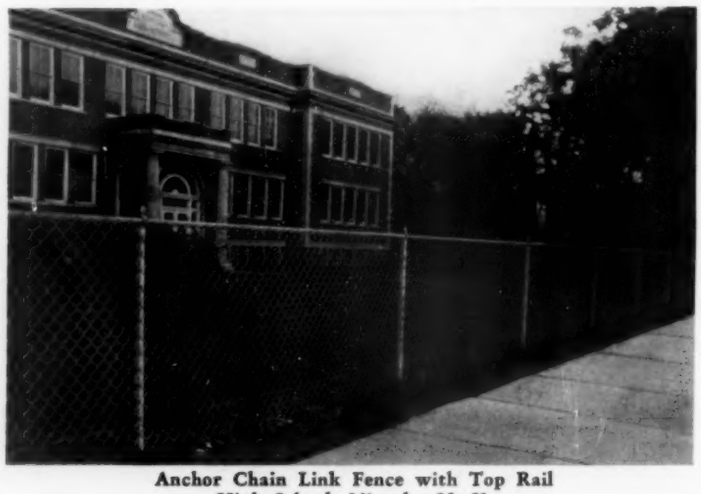
2. **SQUARE TERMINAL POSTS**—stronger because they are square in section. More protective—having no fabric-holding bands and therefore providing no footholds for climbing. Better-looking—because of their graceful lines.

3. **U-BAR LINE POSTS**—made of high carbon steel and U-shaped in section to insure maximum strength.

4. **DRIVE-ANCHORAGE**—grips the soil like the roots of a tree. We have imitated nature's engineering by providing the line posts with a broad foundation. Anchor drive-anchors defy thaws, frosts and the many other strains to which a fence is subjected.

Note: While we strongly advocate the drive-anchor method of setting posts, we can, if desired, set our posts in concrete footings when conditions warrant such a procedure.

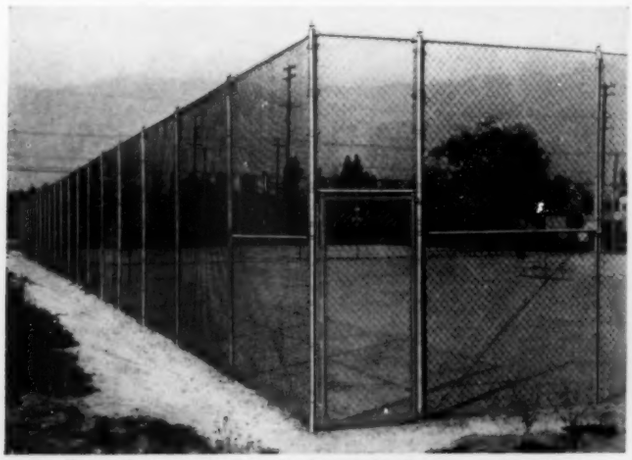
Anchor-Weld Wire Gate



Anchor Chain Link Fence with Top Rail
High School, Mineola, N. Y.

Anchor U-Bar Line Post

Anchor Square Terminal Post



Anchor Chain Link Tennis Court Enclosure at Pasadena High School, Pasadena, Calif.

Anchor-Weld Fence Surrounding the Hartford High School, Hartford, Conn.

CONTINENTAL STEEL CORPORATION

Manufacturers of Chain Link Fence for All Purposes

GENERAL OFFICE:

Kokomo, Indiana

Operating Plants: Kokomo, Indianapolis, Canton

SALES OFFICES IN ALL PRINCIPAL CITIES

Product . . . Service

Complete Chain Link Fence, including posts and fittings.
Gates and Gate Fittings.
Engineering and Erection Service.

Fabric

Fabric of Konik, containing copper, nickel and chromium—a stronger steel, rust-resistant clear through, of high tensile strength. Wire gauge No. 9 or 6 woven into a 2-in. chain link mesh. Top and bottom selvages of fabric are barbed.

Coating of heavy zinc applied by a special process of "hot dip" galvanizing to insure uniformity and adhesion of coating.

Posts

Line posts: H-Section, weight 4.3 pounds per foot or 2½" O.D. tubular pipe, weight 3.65 pounds per foot. Spaced not more than 10 feet apart, on centers.

Terminal posts: Tubular steel pipe; end, corner, and pull posts 3" O.D., weight 5.79 pounds per foot. Gate posts 3" O.D. or larger, depending on width of gates.

Fence Styles

Continental offers 12 styles of top construction for chain link fence. The three most popular styles are illustrated at right.

Fabric Ties

No. 6 gauge, round aluminum. Six furnished to each 10 feet of top rail and one to each foot of line post height.

Tension Bands

These bands which hold fabric to terminal posts have a beveled edge and are slotted to receive special lock pin, eliminating bolts and nuts. One for each foot of fabric height.

Gates and Fittings

Single and double types, frames of heavy tubular pipe, corners electrically welded, or fitted with heavy malleable iron castings. Manually or mechanically operated.

Engineering Service

Our engineers are prepared to work with your plant engineers in laying out the most economical installation for your purposes.

Erection Service

Trained erection crews are available anywhere for correct and economical construction. When local labor is used Continental will supply competent foreman and inspection service.

14★ Construction Features

★ Fabric of *KONIK steel containing copper, nickel and chromium for greater strength and rust resistance clear through.

(* U. S. Patent No. 1874814.)

★ Heavy coating of zinc applied by a special process.

★ Full gauge wire woven in exact mesh.

★ Heavier "H" Section Line Posts.

★ Self Locking Barb Arm.

★ Heavier Post Caps and Arms.

★ More Post and Top Rail Ties.

★ Inside-Outside Top Rail Coupling.

★ New Type Lock Pin Eliminating Bolts and Nuts for Tension Bands.

★ Stronger and more easily operated Gates and Locking Devices.

★ Improved Pivot Type Hinge.

★ Quality Materials and each part designed for its particular place.

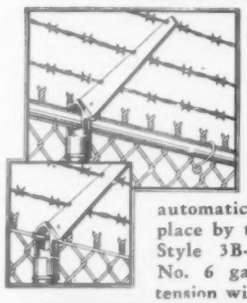
★ Engineered and erected for each specific job.

★ Continental CERTIFIED QUALITY materials and workmanship throughout.

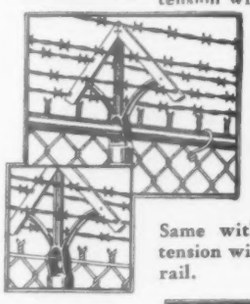
WRITE FOR "PLANNED PROTECTION"

For most complete manual on modern protection of property and control of traffic, just write for "PLANNED PROTECTION." Continental Steel Corporation, General Offices, Kokomo, Ind. Distributors in Principal Cities.

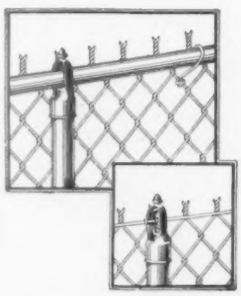
A STYLE TO MEET EVERY FENCING NEED



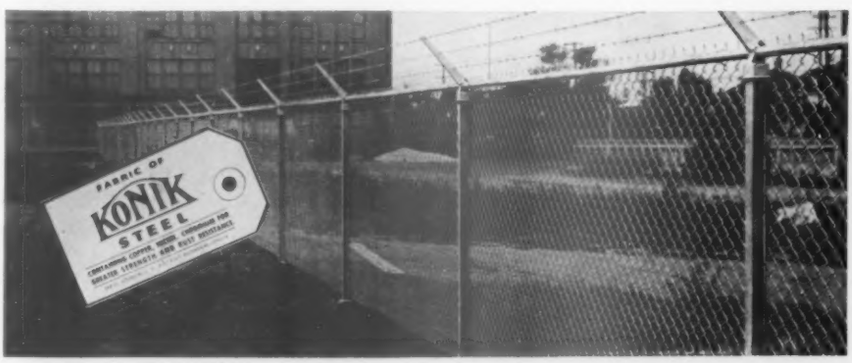
Style 3B - R—Three strands of barb wire with top rail. Arm of 12 gauge pressed steel. Barb wire held in angle slots and automatically locked in place by tension.
Style 3B-W—Same with No. 6 gauge coil spring tension wire instead of top rail.



Style 5B - R—Five strands of barb wire with top rail. Top rail of tubular steel 1⅝" O.D. Has 7" expansion sleeves.
Style 5B - W—Same with No. 6 gauge tension wire instead of top rail.



Style NB - R—No barb wire with top rail.
Style NB-W—Same with No. 6 gauge tension wire instead of top rail.



CONTINENTAL *Chain Link* FENCE

COPPERWELD STEEL COMPANY

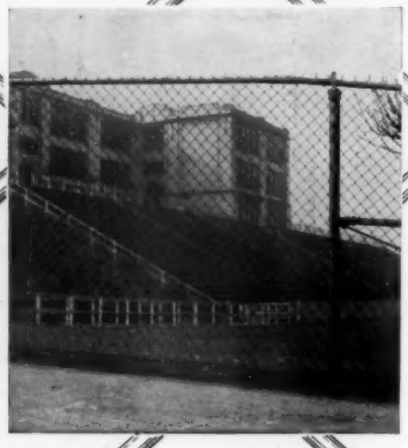
General Offices and Mills: Glassport, Pa.

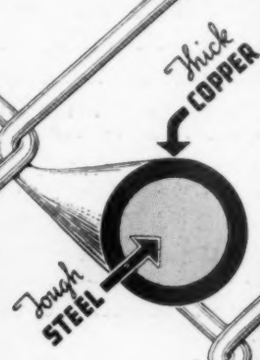
DISTRICT SALES OFFICES

COPPERWELD *non-rusting*

FENCE FABRIC *and* BARBED WIRE

COMBINES THE RUST RESISTANCE OF COPPER WITH THE STRENGTH OF STEEL





WHY COPPERWELD NON-RUSTING FENCES COST LESS TO MAINTAIN

Copperweld Non-Rusting Fence Fabric is made from the same Copperweld wire that has been used so successfully by Electric Light and Power Companies, Railroads, Telephone Companies, etc., for more than twenty years. It has a core of alloy steel for strength, surrounded by a heavy layer of pure copper for protection against rusting. In Copperweld wire the heavy protective coating of pure copper is actually welded to the steel core—not plated on. Copperweld wire can't rust any more than solid copper wire can rust—yet it has all the strength of steel.

That's why Copperweld fence fabric is non-rusting, never needs painting, and costs less to maintain.

Copperweld non-rusting fences—like Copperweld wire in its many other uses—have been tested in the laboratory of time. Many Copperweld fences have been in service in highly corrosive areas for periods up to fifteen years. Not one dollar has been spent for the painting of fence fabric on any of them.

Copperweld non-rusting fences are available through reputable fence companies everywhere. The initial cost of a Copperweld non-rusting fence is surprisingly low, and its annual cost is the lowest of any fence made—because it never needs painting. Write to the Copperweld Steel Company, Box 500, Glassport, Pa., for complete information.

COPPERWELD FENCE FABRIC and BARBED WIRE
COSTS LESS PER YEAR - - - - *Never* NEEDS PAINTING

CYCLONE FENCE COMPANY

UNITED STATES STEEL

General Office: Waukegan, Illinois

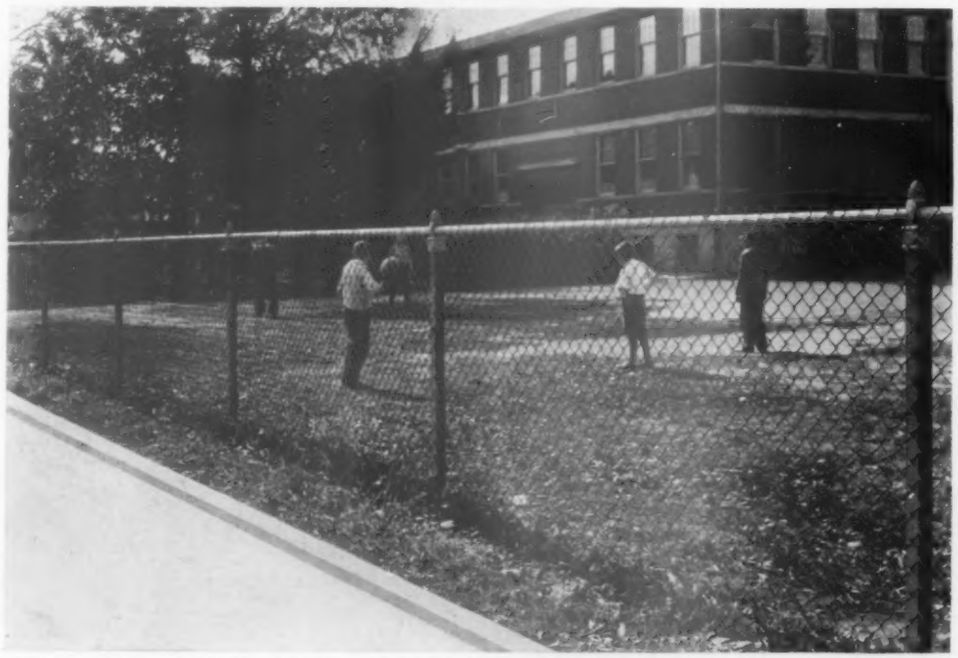
North Chicago, Ill. Waukegan, Ill. | Cleveland, Ohio Newark, N. J. | Fort Worth, Texas Greensburg, Ind. | Tecumseh, Mich. DeKalb, Ill.

PACIFIC COAST DIVISION
STANDARD FENCE COMPANY

Los Angeles | San Francisco | Oakland, Calif. | Portland, Ore. | Seattle, Wash.

Cyclone Fence is produced and erected by the world's largest manufacturers of property protection fencing. For years the Cyclone Fence Company has specialized in fencing school property. Cyclone Fence is the recognized standard for every school and playground purpose.

Enclose your school grounds with genuine Cyclone Fence to provide maximum protection for your school children.



Cyclone Safeguard Chain Link Fence for School Grounds, Playgrounds, Parks, Institutions, Etc.

Fence your school Athletic Field with Cyclone and get more paid admissions to every game.

Because of its long, trouble-free service, you will find Cyclone Fence most economical in the end.

Learn how to test the value of any chain link fabric **before you buy.** Ask for a copy of the booklet "Fence—How to Choose It—How to Use It" and the Cyclone "12m" folder which shows how Cyclone's "12m" process of extra heavy galvanizing means longer fence life at small extra cost.

Cyclone Invincible Chain Link Fence for Athletic Fields

Cyclone Window Guards are sturdy—save money

W. F. ROBERTSON STEEL & IRON COMPANY

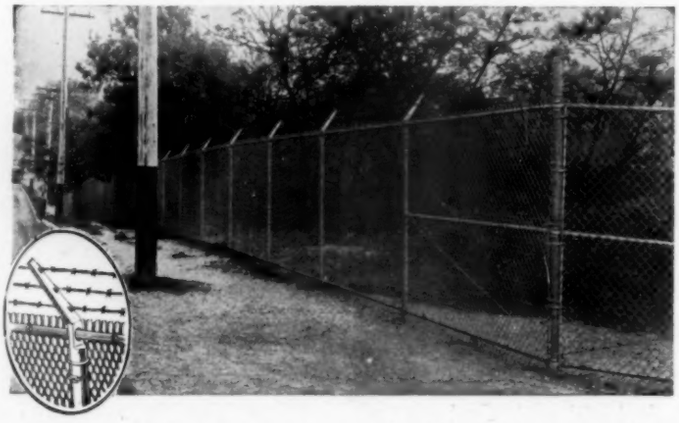
Robertson-Cincinnati Chain Link Fence

Second and Elm Streets, Cincinnati, Ohio

A ROBERTSON non-climbable Chain Link Fence is available in all styles to serve every purpose, Tennis Court Backstops, Athletic and Swimming Pool Enclosures, etc.

Robertson Style 900 Tennis Court Fence

STANDARD TYPES: ROBERTSON STYLES 400 and 500, built in heights 3 ft. to 12 ft. inclusive, 6 ft. considered as standard. ROBERTSON STYLES 800 and 900 are recognized as the ideal constructions for Tennis Court Backstop Fences. They are available in three heights, 8, 10 and 12 ft., standard height 10 ft. FOR ATHLETIC FIELD ENCLOSURES ROBERTSON STYLES 600 and 700 are recommended. These styles have extension arms, carrying three or five strands of barbed wire, as preferred. On the five strand construction, the barbed wire extends on both sides of the fence line. Either style can be furnished in any height up to 12 ft., standard height 7 ft. overall, including barbed wire.



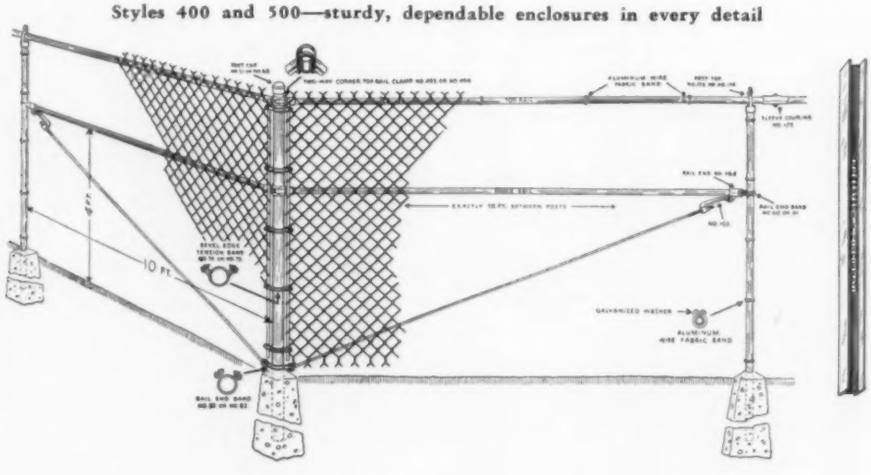
Robertson Style 600 Fence (3 strands of barbed wire at top)

ROBERTSON CHAIN LINK FABRIC is made of copper bearing steel of unusually high tensile strength, heavily galvanized by the hot dip process after woven, to meet any requirements. LINE POSTS are available in either the H-section style, weighing 4.3 lbs. per foot, or 2½" O.D. (Outside Diameter) tubular pipe construction, weighing 3.65 lbs. per foot. Standard spacing not more than 10 ft. on centers. TOP RAIL is 1⅝" O.D. tubular steel pipe, weighing 2.27 lbs. per foot. END AND CORNER POSTS made from 3" O.D. tubular steel pipe, weighing 5.79 lbs. per foot, all manufactured from copper bearing steel, galvanized by the hot dip process. BARBED WIRE 4 point pattern hot dip galvanized after fabricated.

ROBERTSON CHAIN LINK GATES are heavily constructed, corners fitted with malleable iron castings or electrically welded. Can be furnished in all widths, single or double style, swing or slide type.

QUALITY AND SERVICE have been the key-note to ROBERTSON'S success as fence manufacturers. Only the finest grades of steel and malleables are used. Our Engineers are available at all times to help you solve your problems, without charge or obligation. Let us submit estimates of costs and carry out the erection, if you desire.

Styles 400 and 500—sturdy, dependable enclosures in every detail



Robertson New Heavy Duty H-Beam Line Post

THE STEWART IRON WORKS COMPANY

"Fence Builders to America Since 1886" INCORPORATED

603 Stewart Block, Cincinnati, Ohio

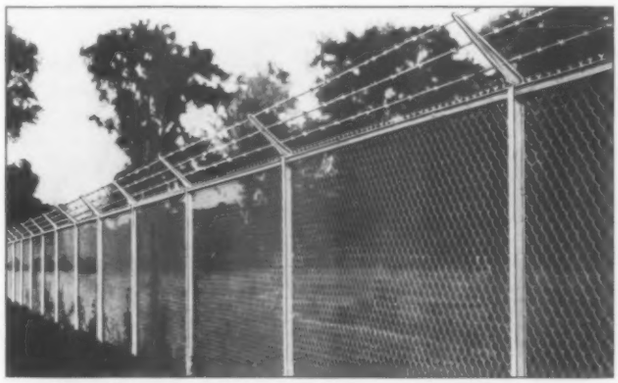
PRODUCTS
Bronze Tablets
Chain Link Wire Fence
Flag Poles
Folding Chairs
Folding Gates

PRODUCTS
Iron Picket Fence
Pipe Railing
Settees
Stadium Seat Brackets
Window Guards
Wire Mesh Partitions

FOR EVERY PURPOSE

Stewart offers Plain or Ornamental Iron and Chain Link Wire Fence and Gates for front, side and rear property lines; for athletic fields, tennis courts, recreation grounds and other school requirements.

Stewart Chain Link Wire Fence is the only ALL BEAM FRAMEWORK construction on the market. The Chain Link Wire Fence illustration below clearly



Typical Stewart School Installation, Vincennes, Indiana

shows this exclusive feature. Notice the Oval-Back I-Beam Line Post with integral extension arm. Obviously this solid post is superior to pipe or other types of post requiring a separate pressed steel arm which may be removed or easily broken. Notice, too, how the beam top rail passes through the post itself—eliminating the need for fittings. The flat, smooth surfaces of Stewart All Beam construction offers maximum resistance to wear, weather and corrosion. This

Typical Stewart School Installation, Cleveland, Ohio

type of fence structure, exclusive with Stewart, is unquestionably the heaviest and strongest manufactured.

Usual heights of style 3-TH shown in illustration are 7 ft. and 8 ft. overall. All materials are of Copper-Bearing Steel hot-dipped galvanized **after** fabrication to assure greatest possible resistance to rust.

IRON FENCES AND GATES

For front property lines where dignity as well as protection is a requisite, Stewart offers a multiplicity of designs in plain or highly ornate iron. Here again Stewart construction is unique. The patented channel rail, exclusive with Stewart, adds immeasurably to the strength of the fence. All fittings are of Stewart design—the result of more than 50 years' experience and research in the fence building field.

METAL FOLDING CHAIRS

Built of strong steel channels. Full size seat with correctly pitched form-fitting back. Stewart Metal Folding Chairs are tip-proof. Standard finishes are: Black, Brown, Dark Green, Mahogany or Taupe. Literature and prices furnished upon request.

WIRE PARTITIONS

Effective and economical enclosures for locker rooms, stock rooms, supply rooms, tool rooms, machinery, power houses, etc. When writing for prices please send sketch giving measurements.

BACKSTOPS

Ideal for hard or soft baseball diamonds, tennis and badminton courts, etc. Sturdily constructed to stand the toughest abuse. Literature and prices furnished on request.

BRONZE PLAQUES

Plaques and tablets of hand-chased cast bronze, are available in stock sizes from 9″ x 16″ to 24″ x 36″. Special sizes will be made to order. Literature and prices gladly sent on request.

CATALOGS—SALES AND ERECTION SERVICE

Literature is available on all Stewart products. If interested in Chain Link Wire Fence ask for Catalog No. 79. If in Iron, ask for Catalog No. 76. When requesting catalogs, please indicate products in which you are primarily interested.

Stewart maintains sales and erection offices in all principal cities. Consult your local classified telephone directory or write direct to factory.

WICKWIRE SPENCER STEEL COMPANY

General Sales Office (Fence Dept.), 70 Niagara St., Buffalo, N. Y.

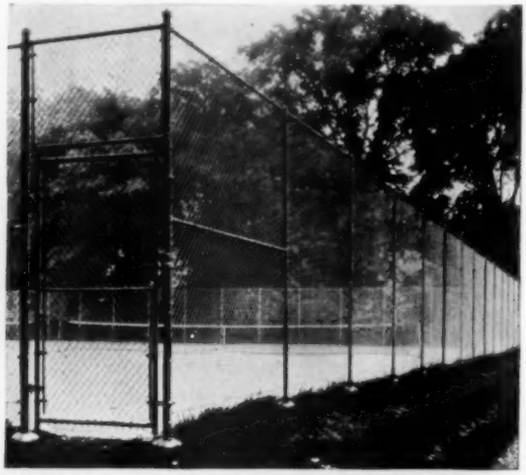
DISTRICT SALES OFFICES

New York City Chicago Worcester San Francisco Los Angeles Portland Seattle

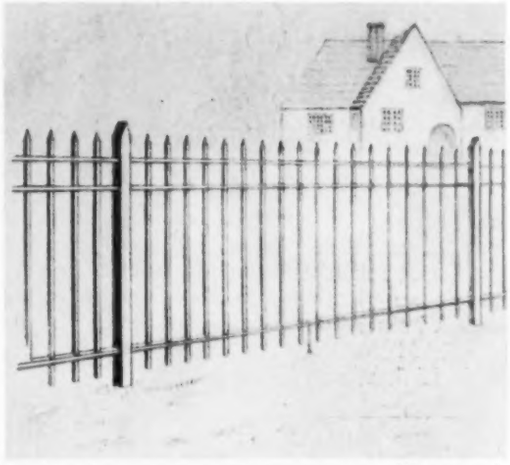
DISTRIBUTORS AND ERECTORS IN ALL PRINCIPAL CITIES

THE Wickwire Spencer Steel Company offers Chain Link Fences for all types of property, including schools, playgrounds, athletic fields, tennis courts, etc. Manufactured entirely in their own plants with complete control from mine to consumer. Sold with complete installation, or if preferred, we will furnish all necessary materials to be installed by others or with the services of a supervising foreman. All posts are furnished to set in concrete footings. (Concrete preserves the metals from corrosion below the surface.) All materials except non-ferrous metals are hot galvanized after fabrication.

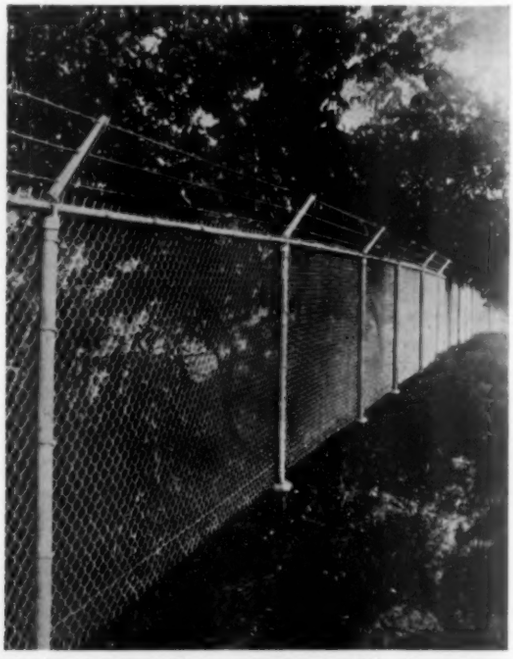
Wickwire Spencer Type 420H Fence, using "H" section line, end, corner and gate posts. A design virtually foolproof as no bolts or nuts are exposed for possible tampering. Gates of similar construction using heavy square tubing with specially reinforced heavy hinges and locking devices. If desired, this type of fence is available with copper bearing pipe posts throughout.



Wickwire Spencer Tennis Court Design. Illustration shows a typical Tennis Court Fence design. Two types are available—310 (light construction) and 420 (heavy construction). Standard heights, 8′, 10′ and 12′.



Wickwire Spencer Iron Picket Fence. We can furnish stock or special designs to conform with your wishes.



Wickwire Spencer Type 423 Fence with three strands of barbed wire. Illustration shows pipe posts throughout. Gates to match. This type is also available with "H" posts same as shown in Type 420H illustration, with gates of similar construction.

Write to this office direct, or to any of our district offices shown above, for catalogs, and full particulars. Distributors may be located near you. Ask us who they are. Estimates and engineering services will be furnished without any obligation on your part.

SECTION VI
PHYSICAL EDUCATION AND ATHLETICS

A WELL-BALANCED PHYSICAL EDUCATION PROGRAM SHOULD PROVIDE FOR WINTER SPORTS TRENDS

By HAROLD M. GORE

Head, Department of Physical Education for Men, Massachusetts State College

EXERCISE in the open on a cold day has long been found pleasurable and practicable. The organizing and equipping of such winter activities has become one of the most conspicuous elements of physical education programs in schools and colleges in the snow and ice belt of the United States. From among the many factors giving impetus to this development, several stand out as especially significant: the increasing general interest in winter sports; the pattern set by the many schools and colleges already featuring winter sports programs; and the realization that winter sports have a definite contribution to make to any modern program of recreational-physical education.

Increasing General Interest in Winter Sports

Evidence of widespread interest in winter sports is to be found in the experience of manufacturers of winter sporting goods, who are forced to keep their eyes on recreational trends in order to help create a demand for their products and to meet it. There are a number of reasons why the past year was one of the greatest in this business, particularly in the development of skating and skiing.

Interest in ice skating is definitely increasing and will undoubtedly continue. This sport has received more publicity than ever before. One of the chief causes of its popularity is the young woman who skated her way to international fame and during the year developed into a star of the movies.

Silver skates tournaments throughout the country have substantially helped ice skating this year. During the season, St. Paul and Cleveland held silver skates derbies for the first time. At St. Louis, where silver skates derbies have been held for at least ten years, the affair drew 15,000 spectators, compared to 9,000 the year before. At Chicago, 42,000 jammed around the lake at Garfield Park to witness the finals of the derby.

In rural districts where there are no silver skates tournaments or indoor rinks, the WPA recreation forces have organized skating activities; as at Northampton, Mass., where last winter there were eleven neighborhood skating areas. Professional troupes giving ice skating shows have also stirred up interest in the sport. Even the weather, though not favorable for skiing, in the East at least, was cold enough last winter to satisfy skaters.

Large indoor rinks were opened in the course of the year. Their operation has been generally successful in the larger cities, and not all of them are necessarily located in the North. The building of a mammoth ice skating rink is being discussed in Miami, Florida. The million-dollar rink in Cleveland was an outstanding success in its first year. Incidentally, a twelve-club High School Hockey League was organized, with fully equipped teams. There was also a college hockey league.

Now that open-air artificial ice rinks exist at most of the well-known European winter resorts, it is the belief of Harry Wade Hicks, of Lake Placid, that they will soon be introduced in this country. No roof is required, though there are doubtless others like the one at West Point, N. Y., which has open sides and a roof. Artificial ice-making equipment using ammonia solution, if installed just under the surface of the ground beneath the area for hockey or figure skating, will permit a community to have ice when the temperature is above freezing. Thus, ice can be provided from November to April—either natural or artificial. Furthermore, artificial ice is "warm," and therefore softer for figure skaters than natural ice formed by spraying in low temperatures.

In the air—a skier takes off at the Nansen Ski Club, Berlin, N. H.

There has been a natural development in figure skating, and clubs are being formed all over the country to further this. The greatest increase in interest is shown by skaters from ten to eighteen years of age; as an example, classes in figure skating at the rink in Minneapolis are five times larger than formerly. All indications are that the increasing demand for figure skates—particularly in girls' skates—will be even more noticeable another year.

In January, 1931, officials of the Boston and Maine Railroad Company appraised the growing interest in skiing and ventured to send out the first snow train. Now, every winter Sunday, most railroads in the East whose lines run into the snow country take thousands of skiers and also followers of other winter sports. Snow trains now include supply cars where all manner of skiing equipment may be rented and a staff of experts give ski instruction. Ski trains have brought prosperity to many communities which had been dormant except during summer months. To other communities prosperity is coming through the manufacture of skis. When the vogue of the ski was new, enthusiasts leaned toward the product of European ski factories. Today not only are American skis highly esteemed by all who ski, but they have the advantage of being produced to meet the ideas of American skiers. The demand for skis has increased to such an extent that ski factories have sprung up all over the country.

Winter Sports at Schools and Colleges

Collegiate winter sports development in the East revolves around two organizations, both founded at Dartmouth. The Inter-Collegiate Ski Union held its championship contest at Middlebury College, Vermont, in 1938, and had some twenty colleges and universities enrolled, including McGill and Montreal, many of the New England colleges, and Princeton, Pennsylvania State, and Cornell.

The seventh annual Intercollegiate Outing Club Conference this year, with Mt. Holyoke playing hostess, is another good example of the co-recreation trend. The Mt. Holyoke Outing Club—in its sixteenth season and with a cabin on the side of Mt. Holyoke and a newly acquired station wagon in its equipment—invited more than thirty colleges. Winter sports play a prominent part in the all-year-round program of the Intercollegiate Outing Club Association.

Four-event meets are the collegiate trend in the Eastern States—downhill, cross-country, slalom, and jumping. It is in the colleges that rounded teams of capable competitors in all four events are most often found. This is especially true of slalom, which finds college competition its stronghold and regular champion. Facilities for this all-round ski development should be available at all snow-belt schools and colleges. It is fortunate when the natural terrain offers these facilities close at hand. In some cases special structures will have to be made, particularly for jumping. The Western Massachusetts Winter Sports Council has recommended that jumping facilities should be provided on small hills wherever feasible. Junior jumps should be from 5 to 30 meters. In Wisconsin night jumping is included in the program and makes a startlingly effective picture.

Dartmouth's Winter Carnival today is a modern winter sports festival, with its complex organization, its collegiate winter sports facilities, and its widespread and intelligent interest in skiing. Dartmouth is leading the way in both recreational and competitive skiing. The period from 1911, the year of Dartmouth's first Winter Carnival, to date is full of important events in the growth of American skiing, culminating with a Dartmouth international ski team which competed all over New England, and on Mt. Hood, at Sun Valley, Idaho, in Australia, and in Chile, and which will be led next year by co-captains, one born in Florida and trained in Europe, the other from his home-town of Hanover, N. H.

Dartmouth is well equipped by natural environment and constructed facilities to handle winter sports guests. At Hanover one finds open fields for slalom as well as slopes and courses for beginners. The artistic side of the Carnival may well be mentioned. Pictorial publicity, winter photography, and winter

sports posters are effective, and the Winter Carnival produces snow sculpture of a most creditable order.

Private schools are not far behind, as shown by the advertisements in Porter Sargent's Handbook. In 1928 five New England schools advertised skiing as part of their extra-curricular activities; in 1937 twenty-three New England schools boasted of everything in this field from imported instructors to full-time devotion to the sport. Twelve schools advertise through pictures in which skiing is obviously the central point of interest.

This year Mt. Hermon School, in Northfield, Mass., celebrated its eighth annual Winter Carnival; St. Johnsbury Academy, in St. Johnsbury, Vt., its fifteenth; Eaglebrook School, in Deerfield, Mass., its sixteenth; Cushing Academy, in Ashburnham, Mass., its seventeenth; and Vermont Academy, in Saxtons River, Vt., its twentieth. Putney School, in Putney, Vt., has not only a ski team, a ski tow, and a youth hostel, but a ski school. Deerfield Academy, in Deerfield, Mass., contributed two members to the last Olympic Ski Team.

Dwight Little, of the Eaglebrook School, feels that the trend of private school skiing will be increasingly for pleasure and less for competition. There will be more trips to the mountains, and more schools will build cabins of their own there. Skiing is a sport of individuals, and thus has the quality of longevity, which many team sports lack. One can ski after school-days are over.

In the *public schools* the growth of skiing is reflected in the appointment of a Committee on Junior Skiing, by the National Ski Association of America. The Association is nearing its 35th anniversary. It covers the ski organizations of the country through its several divisions—the United States Eastern Amateur Ski Association, the Central U. S. Ski Association, the California Ski Association, the Rocky Mountain Ski Association, and the Pacific Northwestern Ski Association. It is to the ski, outing, mountain, and winter sports clubs affiliated with these divisional organizations that skiing owes the sane direction of its phenomenal growth. Interscholastic skiing has been particularly well-organized and administered in northern New England. The Vermont Headmasters have a unique organization.

The Massachusetts State Department of Education has recently issued a skating guide for use in the schools of the state. This is in part the answer to the challenge of the growth of skating and the school's obligation to include skating in its physical education programs. The brochure has sections on skating areas, facilities and maintenance, equipment, safety factors, teaching-aids, skating fundamentals, ice games, figure skating, speed skating, hockey, organization of skating clubs, and ice carnival suggestions. A unit on skiing has also been published.

Broadening Concepts of Physical Education

Many influences are enlarging the scope of physical education programs, particularly in the direction of increased attention to the recreational aspects; all of these tendencies indicate that the present emphasis on winter sports is not a passing fad, but a real trend.

Increasing Interest in Sports for After-School Life.—A recent study of leisure-time activities and desired activities of some 5,000 persons showed that most of these people spent their leisure at home, in quiet, passive, inexpensive recreation—not, however, from choice. Their desires were for out-of-doors, away-from-home activities, most of which involved participation during the winter months in skating, skiing, tobogganing, snow-shoeing, etc. The study showed that the job of providing opportunities and facilities for such participation away from home, particularly during the winter, is still largely to be done.

Recent studies made by the Physical Education Departments of the colleges of the Connecticut Valley, and at Amherst College, Pennsylvania State College, and Massachusetts State College, indicate that the majority of alumni five and ten years out of college favor the teaching of games in college that might continue to be enjoyed in later years, as well as the collective sports and the team games. These college graduates had been engaged in swimming, tennis, golf, hiking, squash, skating and skiing. They expressed a wish that they had devoted more attention to these sports while in college.

A Wide Sports Offering.—Modern physical education programs aim to provide a wide range of activities, suitable to each season, adapted to individual needs and interests. Students should be encouraged and stimulated by suitable facilities and by an understanding administrative procedure to participate in the desired winter sports activities long enough to develop skills, enjoyment and achievement. Individual and dual activities offer variety sufficient to attract different types of participants: skating—figure, speed and hockey; skiing—downhill, slalom, cross-country and jumping; tobogganing; snow-shoeing; and coasting.

Educating for Safety.—Education has already accepted a large measure of responsibility for safety instruction. In line with this trend, every school, public or private, should add skating and skiing to its physical education program. Concerning this, Dr. L. M. Thompson, Assistant Director of First Aid and Life-Saving, American Red Cross, writes:

"The last few years have seen a tremendous boom in the popularity of skiing. This has drawn in a new host of beginners who are a real danger to themselves and others. Safety has not been able to keep up with skiing growth. It is in about the same stage of development as swimming was twenty years ago—thousands of enthusiasts, with little or no training in many cases, and no life-guards, life-savers, or waterfront control."

It has been estimated that the number of people on skis has practically doubled each year for the past several years, and it is expected that the sport will continue to grow in popularity if the safety factor can keep abreast of the growth.

Co-educational Sports.—There is greater participation in athletics on the part of women, and an increase in the so-called co-educational sports. Co-physical education and co-recreation programs are being carried out, especially in junior and senior high schools. The development of skiing and skating is really predicated upon co-recreation.

A booklet on "Snow and Ice Activities," published by the Committee on Winter Activities in Snow and Ice, of the American Physical Education Association, makes recommendations which have been adopted by the Women's Athletic Editorial Committee of the Association, on athletic activities for women and girls. Emphasis is placed on group programs for winter sports, with a view to encouraging schools to include skiing and skating in their winter programs. The Committee feels that the tremendous increasing interest in all snow and ice sports cannot be disregarded in any progressive school where the facilities are available.

Long-Term Planning for Winter Sports

Winter sports might be classified in a number of different ways. Edward Brooks Ballard's (National Park Service) classification of various types of outdoor recreation in cold climates is based on conditions of snow and ice. He divides winter sports areas into two major groups—those for intensive or concentrated use, and those for extensive use.

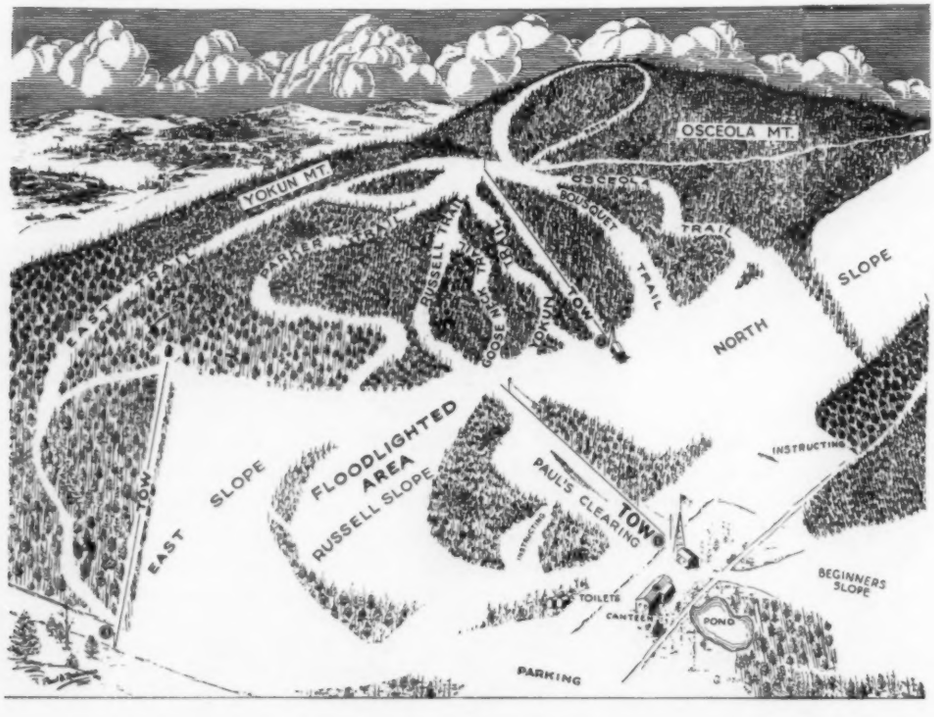
I. For Intensive Use Areas

1. Requiring restricted ice surface:
   - Speed skating
   - Figure skating
   - Ice hockey
   - Ice shuffleboard
   - Ice bicycling
   - Curling
   - Recreational skating
2. Requiring a comparatively flat snow surface are such games and races as:
   - Ski tilting
   - Ski obstacle racing
   - Ski joring, with horses or humans for pulling
   - Snow-shoe racing
3. Requiring snow slopes with special structures:
   - Coasting (where no natural slopes are available)
   - Tobogganing
   - Ski jumping
4. Requiring snow slopes without structures:
   - Coasting
   - Downhill ski running

II. Extensive Use Areas

1. Requiring a large ice surface:
   - Skate sailing
   - Ice boating
2. Large snow-covered areas with flat or rolling terrain:
   - Ski touring
   - Snow-shoeing
   - Dog sledding
   - Horse sleighing
3. Requiring large snow-covered hilly terrain:
   - Downhill ski running on trails and mountain slopes
   - Bob-sledding

The variable factor in the equation of an all-round successful winter sports program is snow. The schools must plan accordingly. Programs must not be formulated on the basis of one or two seasons' experience; enthusiasm must be marshaled for five- or ten-year periods. Meteorological studies indicate consistently



Bousquet's Ski Center, at Pittsfield, Mass., is one of the outstanding ski developments in New England, located in the very center of the famous Berkshire Hills. This map shows rather graphically how an area can be served by three ski tows, with its seven ski trails, and over 200 acres of open slopes. A floodlighting system makes it possible to use one of the finest open slopes for night skiing. There is also a 12-acre gentle slope which has been developed for the beginner and the children

In winter dress the Dartmouth golf course gives a good idea of an all-round winter sports facilities set-up for a college, with current emphasis on open slopes

that in a ten-year period there will be a few years—such as the two just past—with practically no snow in some skiing sections. They also show conclusively that in the same decade there will be more years with ideal snow conditions, and that we may expect, throughout the snow belt, good winter sports conditions more often than poor.

Where is the so-called snow-belt?

Maps from the Weekly Weather Crop Bulletin of the U. S. Department of Agriculture show that it cannot be truthfully argued that skiing is restricted to a small section of the United States. In spite of open winters, we find evidence there that, in such years, twenty days before spring officially began, snow covered nearly two-thirds of the country. In the mountains of the West Coast, skiing is frequently enjoyed throughout the year. In eastern Massachusetts, southeastern New Hampshire, and southwestern Maine, the average annual snowfall is between 45 and 60 inches; northward it increases until in the White Mountain area there is from 80 to 175 inches of snow.

The distribution of snow, month by month, through the average school year, is just as significant as the average annual snowfall. Generally speaking, the White Mountain region has two or three months more of considerable snow than the Boston region. Vermont, New Hampshire and Maine have two or three months more skiing and 22 to 124 inches more snow than Boston, yet almost 80 per cent of the ski club membership in New England comes from Greater Boston, and in spite of a wretched winter eighteen private schools joined the private school ski association.

Barriers to Progress

Costs Too Often Govern.—Physical education programs in schools and colleges are too often governed by expediency and parsimony in the matter of costs. Skiing and skating are to the winter program what swimming is to the summer program. Not only should provision be made for playing fields, shower baths, drinking fountains and athletic equipment for summer and lifetime sports, but we should add ski runs, ski jumps, ski shelters and ski tows, as well as ice surfaces for skating, skating shelters, and overhead lighting.

Competition in Administration.—In many cities there is competition among several departments in handling the physical education programs. The state and the municipalities are responsible for recreation—usually under three different heads—the park system, the recreational system, and the school system. Often these three cannot team up unless public force or public opinion is behind them. Fine skating programs have often been developed by park departments, WPA recreation projects and figure skating clubs, which have combined effectively to provide skating facilities, properly maintained and supervised, with adequate instruction. Except for scattering schoolboy hockey teams, few facilities have been provided under school auspices.

The gradual trend seems to point to the ultimate

control of recreational programs and facilities by educational agencies, thus doing away with duplication of planning, equipment, administration and teaching.

Conclusions

Winter sports are definitely a means of satisfying the desire of many people for out-of-doors, away-from-home, seasonal activity. Just plain skiing and everyday skating should play a large part in these participatory programs, and these sports should increase participation on the part of women, and the interest in co-educational sports.

Despite the costs, our school systems should supply facilities, equipment, and leadership. This is in line with meeting the challenge of educators who feel that the school will eventually have to take over many of the responsibilities formerly accepted by the home, including safety education, the teaching of good manners (that is, sportsmanship), the development of lifetime sports attitudes and techniques, co-educational sports, even public school camping, and the ability to enjoy oneself in either winter or summer in wholesome outdoor recreation.

The well-balanced co-recreational physical education program of the future must include winter sports, and our schools and colleges must supply and maintain the facilities and equipment for them.

THE DESIGN AND CONSTRUCTION OF TOBOGGAN CHUTES

BY SAMUEL P. SNOW

Landscape Architect

A TOBOGGAN slide often provides the incentive which draws from the fireside those who lack the enthusiasm necessary to participate in more active sports.

Location of Slide

The first thing to look for in laying out any sort of toboggan facilities is a gently sloping hill having a maximum grade at its brow of 40 per cent. This percentage may seem very conservative to some, but when it is considered that a speed of more than a mile a minute can easily be obtained under ideal conditions on an iced chute having a maximum grade of 30 per cent, a 40 per cent grade gives as fast a speed as anybody ought to travel in the average toboggan used today.

Secondly, this hill should preferably face north or northeast so that the ice in the chute will melt as little as possible.

The third requirement is at least a 4-inch snowfall for the outrun at the bottom of the proposed chute. If there is not 4 inches of snow on the ground at all times, there must be at least enough snowfall to maintain a course 40 yards wide and 4 inches deep at the end of the chute.

Although it cannot be classified as a requisite, a fourth factor which may be considered in toboggan-slide layout is a location where there is a good view both from the starting platform and from the chute itself.

Slide Design

The entire slide should be built straight. Although topography tends to govern the location of a chute, curves, even though carefully designed by engineers and existent in many slides today, make it possible for a toboggan to go over the sides through careless or reckless use.

The chute should follow the natural contour of the ground, including a few secondary slopes to add variety and speed, thereby avoiding ugly scaffolding and an accompanying increase in construction cost. Some designers advocate building a sudden drop or two on a toboggan chute, but this is thought by the writer to be a poor policy. Often there may be some person riding a chute who has a poor sense of balance and who, if not paying particular attention to a dip, may temporarily lose his hold on the toboggan, become dizzy, and be seriously injured.

If possible, the toboggan slide should run through a wood with a 20-foot open space on either side of the chute to protect upset toboggans from coming in contact with trees. Not only will the shade from the trees give an abundance of protection to the ice in the

chute, but the close proximity of the wood will impart to those riding the toboggans an illusion of traveling at great speed.

At the bottom of the slide there should be a runway clear of trees, poles, fences and other dangerous obstacles. It is a good plan to continue the sides of the chute on the outrun, which should be level to prevent toboggans from upsetting. The idea of building banks of ice-coated snow the same width as the trough to take the place of the sides of the chute is thought to be a poor one, because toboggans will break through any worn spots in the coating of ice, particularly at the edges, causing a rough course and bad sluing.

Construction

The trough must be of the proper width and the sides high enough to prevent toboggans from lurching from side to side and jumping the track. Emphasis should be placed on using good wood in the construction of the chute to avoid the danger of splinters. Painting or creosoting all the woodwork of the slide each year to preserve the wood and act as a disinfectant will aid in keeping the inside of the trough smooth. Where countersunk bolts are not employed, it is very important to use cement-coated nails in the construction of the troughs to eliminate the possibility of any of the nails protruding. The crossbars should be near enough together to avoid strain on the bottom boards, and the trestle work must be strong and solid to prevent vibration.

The following method of construction is suggested as an ideal way in which to build a safe toboggan chute (Fig. 1):

The slide should be built of 1-inch planed spruce boards in sections 16 feet long, each length being in the shape of a trough with the grain of the wood running down hill. The inside width of the bottom of the trough should be 20 inches at the lower end and 22 inches at the upper end, the side planks being 12 inches wide with a flare of 2 inches. All edges and corners should be planed off to prevent splinters. The importance of a piece of corner molding nailed to either side of the inside of the trough where bottom and side boards come together is emphasized as an excellent means of retarding the melting of ice in the chute.

Six 2 x 4-inch crossbars should be used to hold together the boards of each section. Each crossbar should extend 20 inches beyond the bottom boards, and to it should be bolted brackets cut from 2 x 8-inch timbers, to hold the sides in place. The crossbar on the upper end of the trough should be flush with

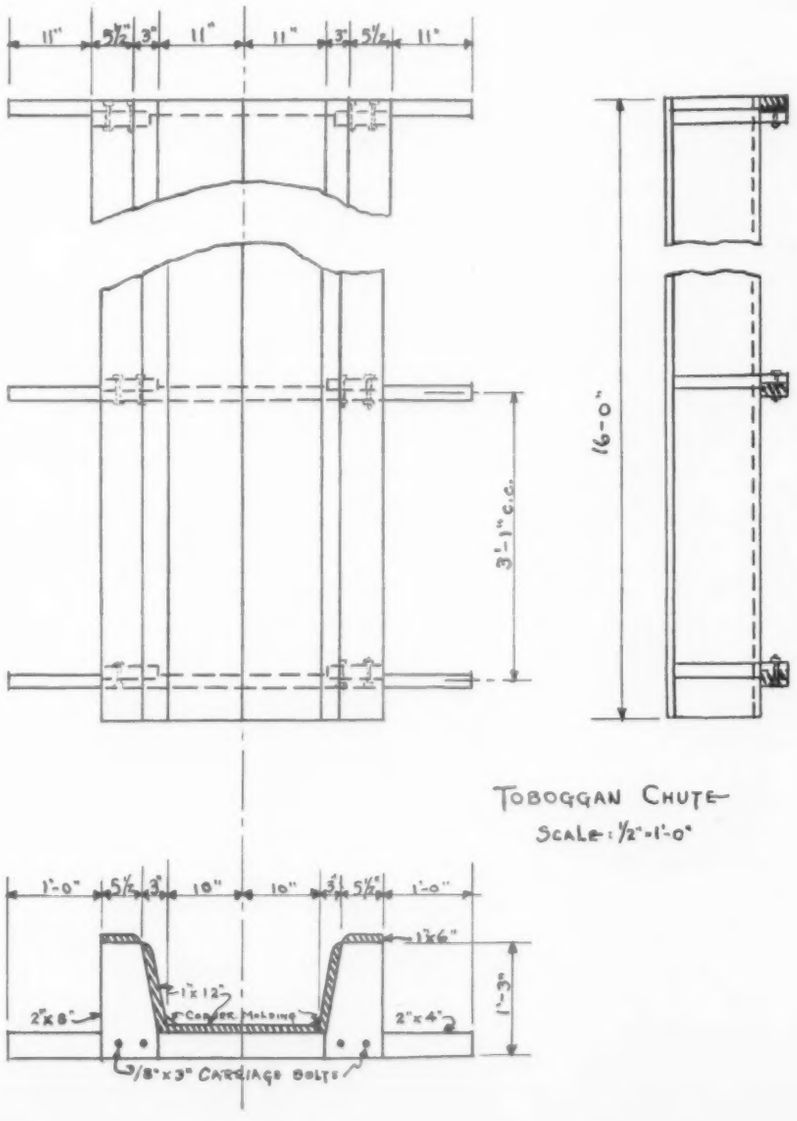


Fig. 1 — Construction details of a safe toboggan chute

the end of the boards; on the lower end, in 4 inches. This would allow each trough to lap 4 inches into the next, the end crossbars being so placed as to butt tightly against each other. The other four crossbars in each section should be evenly spaced.

The troughs should be thoroughly bolted and nailed together, but no nailing should be done in putting the sections together; they should be simply placed in position, beginning at the lower end and fitting in each section, leveling under the crossbars as the ground may require. Two 4 x 4-inch stakes should be driven in front of the upper crossbar in each section, one on either side of the trough, to hold the sections in place. The crossbars should then be nailed to the 4 x 4's.

Dispatching Toboggans

The method of dispatching toboggans from a starting platform often does not receive proper attention from those who construct and operate chutes. The writer believes that the safest way to start a toboggan on its way down the slide is from a tilting trough hinged to the starting platform and so constructed that the front end drops into place at the end of the chute, as illustrated in Figure 2. When the trough is released by pulling a lever, its own weight drops it into place; by stepping on the edge of the trough, it may be brought back to a horizontal position, the lever automatically resetting and holding the trough there while loading another toboggan. The timbers receiving wear in the constant locking and releasing of the tilting trough should be covered with metal to reduce this process to a minimum.

Approach to Starting Platform

The greatest physical benefit most people derive from tobogganing is from the return walk to the starting platform. In order that this part of the sport may be as pleasant as possible, the approach to the top of the slide should be by a gradual slope, a cleated runway or wide stairs leading to the back of the starting platform, which should be of ample size and protected by walls or a railing. For every chute leaving this starting platform, there should be about 600 square feet of floor area to take care of the crowds during rush hours. Also, it is thought that there should be a row of seats along the back and sides of the platform for those who wish to rest after the climb from the bottom of the slide.

On long slides, where it is possible, there should be a road from the bottom of the outrun to alongside the starting platform at the top. Costs for attendants, horses, and sleighs to pull toboggans up the hill again may be defrayed by charging a nominal sum per hour and a fraction thereof in addition for the rental of toboggans.

Maintenance

A slushy day just before an expected freeze should be selected in which to prepare the ice and fill the chute. Snow and water should be mixed to a stiff consistency and spread very smoothly in a one-inch layer on the bottom of the trough. The practice of some operators of packing a two-inch layer of snow on the bottom of the trough and then wetting the surface of the snow to give a thick crust of ice is thought to be dangerous on a slide which is used a great deal during the day. No matter how carefully the ice coating is made, it is not as hard as solid ice, and toboggans will inevitably bite into the worn spots on a busy day, with ruinous results to the chute and toboggans, and maybe the riders. The point is conceded, however, that the ideal type of slide is made just after a snowstorm, giving a good, soft, but well-packed surface of snow which affords a certain buoyancy. This type of slide without any hard surface is the best there is for tobogganing. For chutes which are used daily by a large percentage of the student body and friends of the school, it is safer to have a hard surface. Again it may be said that, as it is not well to slide on sheer ice, a fall of snow to cover the surface of the toboggan chute should always be welcomed.

Quantities of straw should be used when it is desired to check the speed of toboggans on the outrun. The practice of some operators of using equal parts of sawdust and sand in the chute and outrun is rather hard on the toboggans.

Safety

The slide having been made as foolproof as possible, tobogganing on it should be carefully supervised at all times. It is a good plan not to permit the use of the slide unless a starter is on hand to release the clutch, to see to it that the toboggans are not overloaded, and that one does not start until the one ahead has left the chute at the bottom and can be unloaded before the arrival of the next.

It is a most common practice to ride toboggans with people in a sitting position, but with this high center of gravity the toboggans are likely to jump out of the trough on slides where considerable speed is obtainable. Toboggans are safe when ridden in a prone position by not more than two people.

A final and very important safety measure is that of inspecting the slide every night and repairing any worn spots in the ice. Further than this, where a slide has a great amount of traffic during the day, an attendant should be on duty while the slide is in

use, and should have nothing to do but to keep a close watch on the condition of the chute and see that it is fit to be in continual operation.

—The writer of this article has devoted a number of years to visiting and inspecting toboggan chutes in many winter sport areas, interviewing their operators and designers, and reading all available literature on the subject, in an effort to obtain information necessary in the designing and constructing of a chute that is ideal from the safety standpoint. Much of the information which has been gathered and studied is not mentioned in this article, however, since it was thought best to include only such elements of design and construction as observation, experience and deliberation concluded to be the ideal safest type to use.

References

Dyer, Walter A.: "A Practical Toboggan Chute." *Country Life*, 9: 460. February, 1906.

Saint-Gaudens, Homer: "A Private Toboggan Slide." *Country Life*, 13: 312-3. January, 1908.

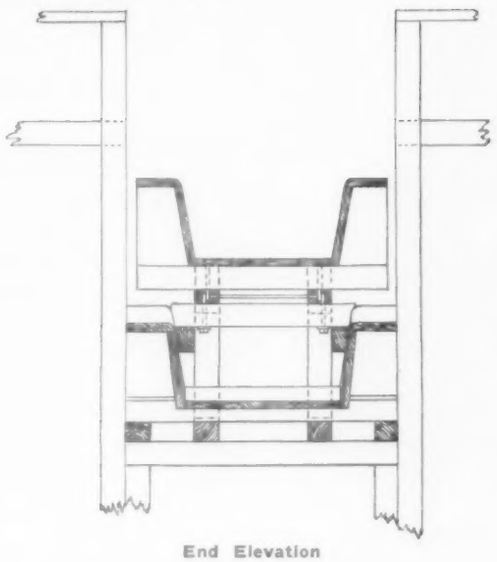
Gage, Earle W.: "Build a Winter Toboggan Slide." *Popular Mechanics*, 46: 1015-17. December, 1926.

Martin, George W.: "Toboggan Slides." U. S. E. A. S. A. Year Book, 1928.

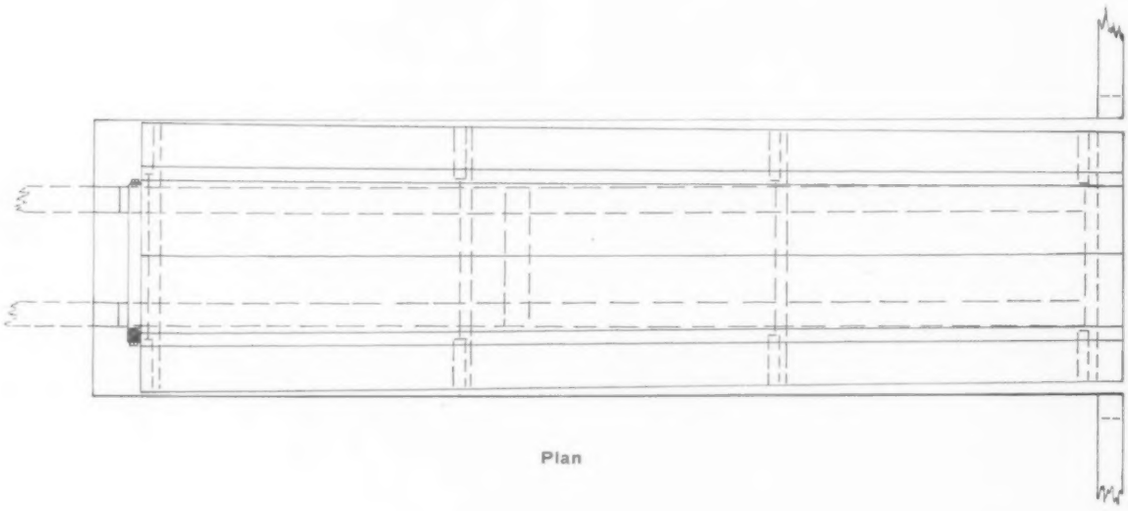
Weir, L. H.: *Parks*, 1: 381-5. New York, 1928.

"Toboggan Slides in the Winter Sports Program." *Recreation*, 24: 608-10. February, 1931.

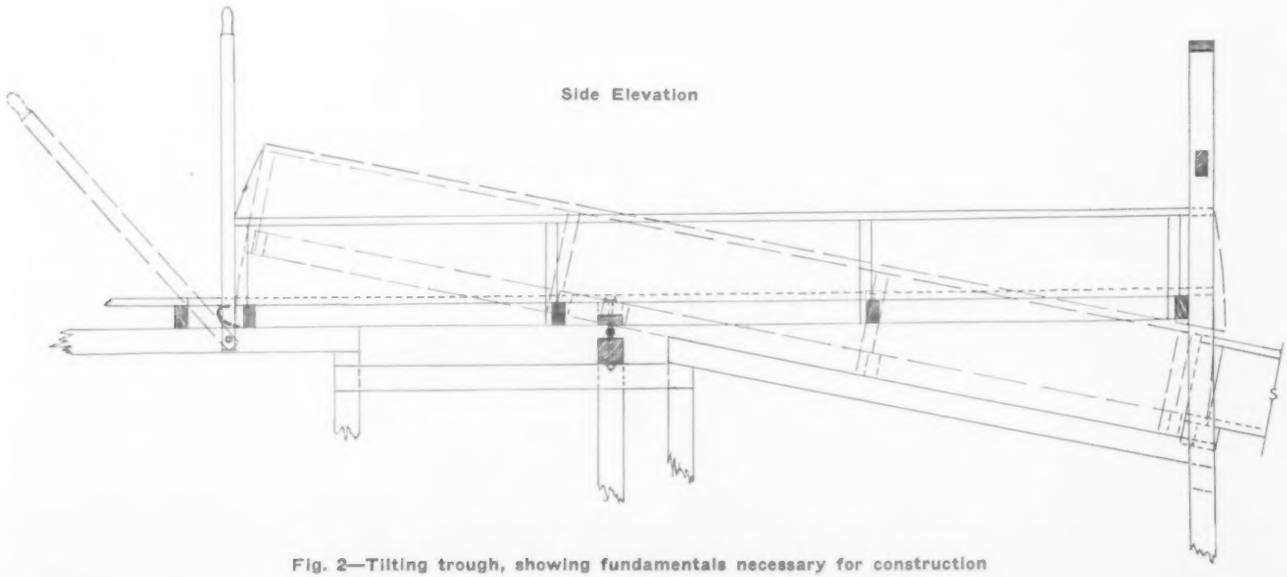
"A Toboggan Slide." *Recreation*, 26: 416-20. December, 1932.



End Elevation



Plan



Side Elevation

Fig. 2—Tilting trough, showing fundamentals necessary for construction

DOWNHILL SKI TRAILS

BY ROBERT W. VINCENT

Institutional Fellow, Department of Physical Education for Men,
Massachusetts State College

FORTUNATE indeed is the school or college in the snow belt located in or near suitable terrain for downhill skiing. Dartmouth College, for example, has its campus winter sports terrain, its own Mt. Moosilauke replete with downhill trails, and many miles of cross-country and touring trails, with ski shelters, surrounding Hanover. Williams College with its own campus Sheeps Hill, is surrounded by the Berkshires and has Mt. Greylock and its challenging Thunderbolt Ski Trail right in its backyard.

Downhill ski trails are, in themselves and by nature, individual problems. Each trail has to be adapted to terrain, weather conditions, accessibility and contemplated use. It should be mentioned here that in all probability about 90 per cent of skiers need open slopes rather than trail skiing. There is a growing feeling among skiers that there is no such thing as a novice trail. Novices and beginners should stay on the open nursery slopes. Ski tows should be reserved to serve open slopes. Ski trails should be constructed for the competent skier and, while designed for safety, should be challenging enough to his sporting instincts to give him a real ride!

The safe ski trail would be narrow at the top and fanned out to a very wide open slope at the bottom, with no turns, so that a falling skier could not hit trees.[1] This amounts to open slope skiing. The most universally recommended type of trail is a continuously turning trail which holds the skier's speed down to a point where he can make the turns. This kind of trail should be over and around terrain that will test the skier's ability.

Sound Advice Important

School authorities contemplating trail construction should realize that the first and most important step in the building of a ski trail is to get an advisor that knows his business. There are so many angles to the designing and construction of a downhill trail that it takes a person who has had experience in the field and knows all the answers. If possible, the ski-trail advisor should be a skier, should have a smattering of engineering, some forestry, and previous experience in trail construction. Such persons may be available at local ski clubs. It is best if he is local, for then he will probably be more familiar with the countryside and its wind, snow, rain, frost, and general weather conditions, all of which are necessary factors to be considered before construction is attempted.

Locating the Downhill Trail

Given a capable advisor, the next step is to choose the location of the trail. It is important and necessary that the trail be accessible; therefore, build it within reasonable distance of good roads. Do not make it necessary to build roads to the trail later on! Take into consideration the fact that it will be necessary to provide parking space for the skiers' cars. There should be ample room plowed out on ground suitable for parking.

The trail itself should have as nearly a northeast exposure as possible, to protect it from the wind and sun. However, local existing wind conditions may alter this exposure requirement. Keep in mind that the trail should be laid out in a spot that is desirable not only from the standpoint of being technically correct but also from the beauty angle. The general appearance of a ski trail adds immensely to its popularity.

A cruising survey can be done more quickly and thoroughly in the spring, after the snow is gone but before the leaves appear, or in the late fall. At such time foliage does not restrict the view, and the detail of the ground surface is not obscured by low summer growth of ferns and shrubs. One of the most important factors of safety is smooth ground, particularly on the turns.[2]

After selecting the general location of the trail, the next step is to lay out its course. This is an interesting as well as a highly technical procedure. Perhaps the first move is merely that of "marking" the trail with the axe before any clearing is done. String from tree to tree, and stakes driven into the ground, designate the route of the trail. Whenever possible, avoid areas where there are ledges, huge boulders, or natural washouts, and avoid brooks and streams. Spruce areas, with their shallow roots, usually grow on rocks that will eventually cause uncontrollable erosion.

Trail Construction

Plan to start work on the trail in the spring, so that it will be entirely completed before snow falls. If not, numerous dangerous obstacles may be reassur-

[1] E. H. Hull.

[2] Charles N. Proctor.

ingly covered and hidden by a blanket of snow. Then, too, when it is necessary to excavate, frost in the ground makes the task more tedious and requires much more time. Finish all construction work so that grass, seed, turf, and trees planted have sufficient time to get well rooted and started before winter sets in. If the trail requires a great deal of grass seeding over excavations, it is best to plan to finish construction in time to plant seed and let the soil settle over an entire season before attempting to use the trail.

Now comes the task of cutting the trail, removing hazardous obstacles, and leveling off and smoothing it. All hardwoods should be removed from the trail and from its edges. This is done by cutting off the tree to within an inch or two of the surface of the ground. Leave the roots and what is left of the stumps in the ground to help prevent soil erosion. Soft woods in the trail may be removed, but can be left and encouraged to grow along the side of the trail, since they prevent snow from drifting and offer shade from the sun. Care should be taken to cut off all sapling stubs, whose small tips can easily trip a runner if exposed.

The most obvious place for a runner to go off the trail and into the woods is on the lower outside section of a curve; therefore, it is always desirable to cut low and wide below and beyond such turns to provide additional room for the skier. However, do not cut too deeply at such points, since it might give the impression that the trail continues straight down instead of turning.

Stumps and logs that have been removed from the trail should be trimmed and laid on the lower edge of the trail and filled in along the side with small stones, leaves and brush. Before doing any grading, it is advisable to burn off material that it is desired to get rid of, for seed growth is hindered on a newly burned area. Natural bumps in the trail add to its "sportiness" and should not be removed except on curves where it is essential to have a smooth surface. Create no unnatural or exposed banks of earth on the trail surface by excessive grading, and preserve natural growth of shrubs and wild flowers.

It is advisable to have trails as wide as possible to insure greater safety. A minimum width of 30 feet on straightaways and 50 to 60 feet on curves and points of unavoidable hazards are desirable.[3]

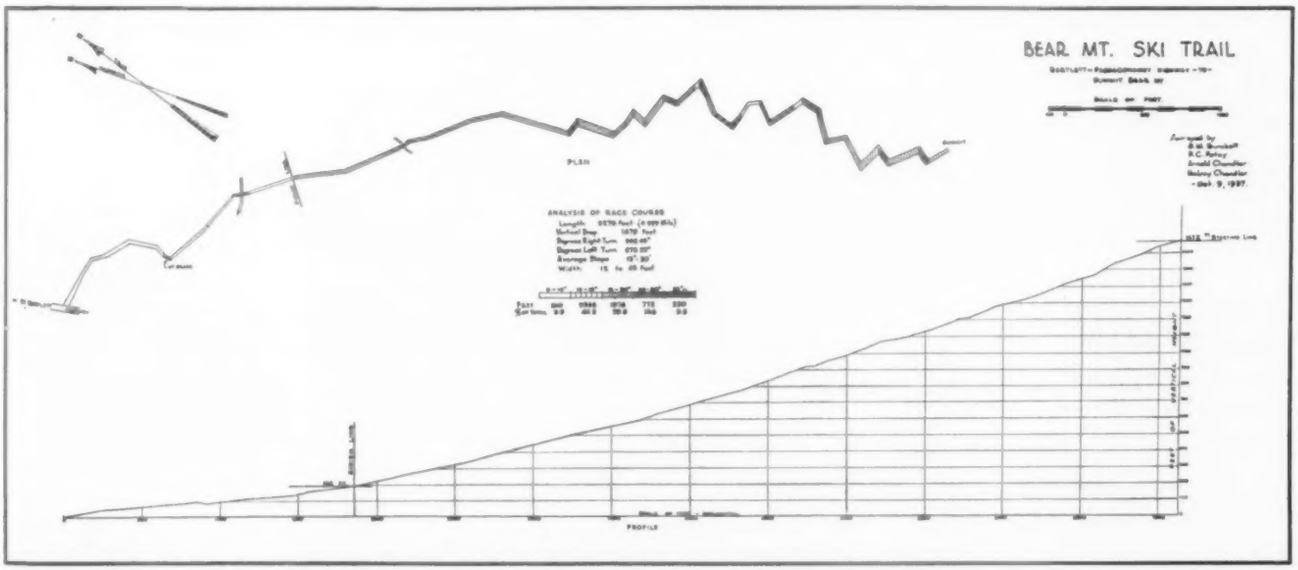
In order that the trail may be as interesting as possible, a variety of curves is necessary. However, do not construct a series of sharp curves in succession.

Reverse Banks

While still very controversial, this question of the banking of curves on ski trails resolves itself into a feeling on the part of most skiers and ski engineers that ski curves, like ski trails, should be adapted to the terrain. In general, most skiers seem to feel that curves should not be banked. It is too artificial—too much like a bob-sled run or a coal chute.[4] Occasionally it may be necessary to have some slight banking, depending on conditions. However, most skiers feel that the banking of ski trails is unnecessary. Skiers are supposed to be able to manipulate themselves over all sorts of terrain at varying speeds and should not be spoiled or hampered by artificial banking.

The safety of a turn depends chiefly on the amount of room available in case of a spill, taking the corner too wide, etc. But an abrupt turn should never be

[3] L. C. Roy.
[4] Bartlett Hendricks.



A graphic presentation of the Bear Mountain Ski Trail which indicates a method of showing vertical descent for any given trail, gradients, and radial indices of curves

made on too steep a slope. Sharp curves should be cut wide enough to allow ample room for side slipping and falls.

Reverse banks are much safer because they are easier to negotiate, and an outside fall is very rare. Without a reverse bank an outside fall is much more frequent. (An outside fall pitches the skier into the woods head first as against feet first, which is less dangerous.[5]) A skier who fell at high speed on a banked curve would slide across the turn and then drop off the edge of the bank. Banked turns are apt to get rutty and worn. Maintenance enters this banking argument also. Banking is not recommended, since it requires steeper super-elevation.[6]

Types of Trail Turns

The real character of a trail is determined by the detail of its turns. Each turn should be of an individual character. Too much space can hardly be allowed for skidding on a corner. The more change there is in gradient the better.

There are several major types of turns:

From a wide section allowing direct descent, or from a straight, narrow section of direct descent, into a traverse

A turn from a traverse into an opening with direct descent

A turn from one traverse into another. Variety is achieved by a series of several such turns, one following the other, with practically no traverse between them

The check turn. Designed for cutting down speed and mostly for contrast

It is best to build the trail widest below the turn, since the greatest danger from a runner's striking trees on the side of the trail is at the lower outside section of the turn.

The trail should be sufficiently wide at the lower outside section to allow for the skidding that is inevitable

[5] Charles L. Parker.
[6] C. L. Graham.

Erosion Control

Erosion is a geological or physiographic process caused by such natural forces as running water, wind and frost. The control of erosion should be considered carefully in ski trail construction. It is essential during and after rains, the melting of snow, and freezing and thawing during dry weather as well as wet.

With weather such as the New England climate is subjected to, where we have numerous thaws and occasional rains, it is necessary to take care of excess water on and along the trail. Occasionally a spring is found underneath the trail itself. "Bleeder" drains are the best type for getting rid of such water, and also for places where large stumps and boulders have been removed. A bleeder is merely a buried rock drain and is entirely underground. The water passes off through this type of drain without coming to the surface at all.

In many instances the trail may be in the natural course of surface water, and when there is a rain or a thaw, the water will follow the course of the trail downhill. To avoid washouts on the trail, the water must be diverted by means of a cross or side drain. A drain ditch along the side of a trail will aid greatly in keeping fast rushing surface water from washing out on the trail itself. Existing conditions on any particular trail must be carefully studied in order to put in a proper drainage system.[7]

Northward-facing slopes receive sunlight at a lesser degree of incidence and for a shorter period of time; also, they are usually protected during the long winter period by a continuous cover of snow or frozen soil. On the other hand, a southward facing slope is relatively sunny, and thaws out, accompanied by the erosive action of running water and other denuding processes that occur with a thaw.

One of the more important factors in erosion control is that of having sufficient shade along the trail to protect the snow from melting. Evergreens planted along the trail have proved successful not only in providing shade but also in acting as buffers that prevent snow from drifting. Evergreens soften the raw, severe edges of the trail, making them more pleasant to fall into as well as adding color to the landscape itself. Evergreens should not be clipped of their lower branches, because this makes a place for ice to form from water dripping off the upper branches. It also leaves a hard trunk exposed.

Woody shrubs should be removed from the trail, for they absorb the sun's rays and cause premature melting of the snow. All bare soil acts in the same way and then washes and slides where it is exposed on steep bankings. Where there is loose soil on such steep bankings, it is best to corduroy with logs. This

[7] Charles L. Krtil.

is a temporary procedure and should hold until a good root growth of trees and sod can be established.

Ski-Trail Cover

The trail should be seeded over, or sod should be laid on all places where the soil is exposed. If there is a good growth of sod nearby, such as a mountain meadow, it is advisable to sod as much of the trail as possible. Usually a large area can be covered by a strip of sod and a strip of seeding. A strip of sod will soon spread and form a strong cover. Plant the sod before or during a wet season and as soon as possible after cutting. Laying sod on the base of the convex curve of the profile is advisable, since the worst erosion occurs there. When sod is not available and it is necessary to seed an area, sheep's fescue and oats are recommended. The nursery crop of oats grows up first, thereby keeping the crop of weeds down. It also sets up a fibrous root system that stays in the ground long after the stalk dies.

Oats or other cereal grass should be sown in furrows or drill rows. Broadcast sowing is less effective because it does not grow as well from surface sowing and it is too easily found by birds and rodents. Broadcast sowing of the fescue, however, is recommended, and if a trail is graded and sown correctly, it is possible to ski on it with not more than three to four inches of snow.

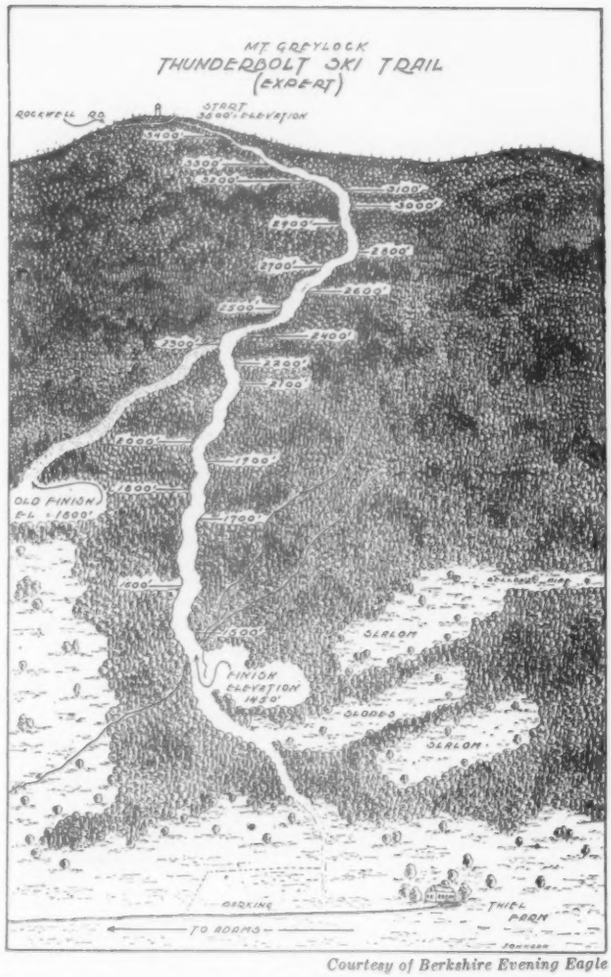
Maintenance

Now that the trail is complete in its construction, it must be maintained. Seedlings and "suckers" will grow up throughout the summer months, and they should be cut off before they get too large. Blackberry briars are extremely bothersome, for they choke the grass roots and prevent growth of sod. The briars must be cut or, better, pulled out as seedlings, and their growth can be checked. Washouts will occur and must be taken care of before they get too large. Trail markers have to be replaced and repaired.

Ski Safety

Most ski accidents result from skiers attempting runs obviously beyond their ability. Accidents may occur on ski trails because of steep grades, slippery surfaces, narrow trails, holes in surface, inexperienced skiers, poorly equipped skiers and experienced skiers running out of control.[8] To repeat, most accidents are due to wild skiing, as on the highway they are due to wild driving.[9]

Blind crests are dangerous, and the skier should be able to see at least 50 feet ahead.[10] It is recommended that skiers should be made to climb on skis, or that a climbing trail be constructed to one side of the downhill trail.



Courtesy of Berkshire Evening Eagle

Perspective showing vertical drop and suggesting curves of one of the four first-class major ski runs in the East

Summary

In summarizing downhill ski-trail construction that a trail may be interesting and reassurably safe, it boils down to this principle: space must be maintained at all places on any ski trail to allow a skier to come to a complete stop upon observing an emergency. Obviously, if the terrain above a crest allows for high speed, much more space is required than when the crest can be approached at slow speed. There is no standard width. The width must be determined by a correlation of four factors—types of skiing the trail is designed for, slope, surface, and normal speed expected at the particular point. Ten feet may be sufficient in one case where in another as much as 100 feet might be required.

Slopes of 35 to 40 degrees are indicated for the better skier. The length of steep trails must be considered. After all, a ski trail is built purely for the sport and as a test of skill and ski technique, and is

[8] C. L. Graham.
[9] C. N. Proctor.
[10] Bartlett Hendricks.

certainly not constructed with the idea of getting from one point to another in the least possible time. It may seem that way because of the publicity given to races.

In conclusion, clinical evidence is available to show that skiing accidents are usually due to reckless carelessness on the part of the individual skier. Design, construct and maintain a reasonably wide trail, with as many sweeping curves as possible, with different terrain and gradients, properly smoothed, then given a reasonable amount of snow cover; ski this trail under control and there will be no falls! It can be said that anyone, expert or novice, can ski any trail in a dangerous manner—hence, any trail can be dangerous. Ski under control (on a correctly designed and made trail) and no one will ever get hurt.

THE CONSTRUCTION OF SKI JUMPS

BY LAWRENCE E. BRIGGS

Assistant Professor of Physical Education, Massachusetts State College;
Chairman, Junior Committee, National Ski Association

ONLY a few years ago youngsters—and even oldsters—were satisfied to use for a ski jump a wooden box or boxes with boards or planks laid across the top, in the middle of some natural slope. Even today this same project is in evidence in many localities where better ski jumps do not exist. From such a simple start as this has come the urge to jump longer and farther than the other fellow. Competitive jumping has furnished the research laboratory, and has resulted in much better ski-jumping facilities for the average person. Today major ski-jump hills are masterpieces of engineering, design, and construction, as well as of architectural skill.

It is well to remember that a smaller hill for the beginners as well as the advanced skiers is best for practice. The ski jumper should work up progressively. Start on a small hill with a small bump and increase the size of the hill and the size of the bump as skill improves, compatible with the ability displayed.

There are two types of ski-jump hills. One is a natural hill, due to the topography of the land, which requires a minimum of construction; the other is artificial in that it has an artificial slide or trestle leading at least to the take-off.

The more money there is to spend, the more careful the builder must be.

Location or Site

Do not construct a ski jump unless the climate and exposure provide or insure a reasonable amount of snowfall under normal conditions. This involves a study of snowfall and temperature as well as skiable days in the locality selected.

The slope should face north or northeast. If that is not available, it should face east rather than south or west, although these exposures could be used as a last resort.

Make a thorough study of the area and find out where the snow stays longest. Where is the best protection from the wind? A valley site or trees give welcome protection. It is feasible to plant rapid-growing evergreens, for these will soon assist in holding the snow and eventually serve as a windbreak. Is the hill well shaded by trees to keep the snow from melting?

If possible, have an aeroplane fly over the area of the jump (as low as practical and yet safe) on several different days to study the air conditions. If the air is bumpy, it would be wise to realize that something is wrong and that another site would be preferable.

Godfrey Dewey makes three suggestions which are helpful in looking for a satisfactory location:

1. About 40 per cent of the total vertical height available, including tower if any, will be required for the upper hill; that is, will lie above the take-off.
2. The steepest part of the lower hill will lie between 50 and 60 per cent of the vertical height of the lower hill below the take-off.
3. The longest jump which can be developed without undue sacrifice of desirable characteristics will be from 5 to 15 per cent longer than the vertical height of the lower hill.

Next, the hill should be readily accessible, as near the school as possible and within a quarter of a mile of a plowed road.

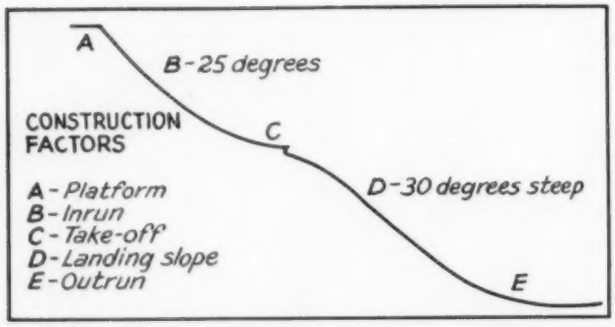
In the East and far West many natural hills may be found, but in flat sections towers and trestles must be constructed.

The jump

Views of the Nansen Ski Club's jump. At left, the start

The take-off

Courtesy of Nansen Ski Club, Berlin, N. H.



The profile drawings of available hills should be compared with a profile known to be good

Each hill has its own peculiarities and is a special problem. First, make a profile of the available hills. Some hills make better slopes than appear at first glance. When you have the profile, scale it down or up to a hill known to be good, and trace it on a piece of tissue paper. Place this profile over the profile of the known hill, and observe how the two fit. Now it is easy to adapt and adjust your hill so that there will be a minimum of work to do. When you have selected the proposed site for your hill, have an experienced jumper, an engineer, and an architect look over your choice, and then work out a plan, estimating the amount of work and the probable cost; otherwise, most of the work will be one of trial and error.

In general, use as little wood as possible, because of the upkeep involved. If wood is used, treat it with some reliable preservative. Periodical painting and application of wood preservatives keep the maintenance cost down.

The Approach or Inrun

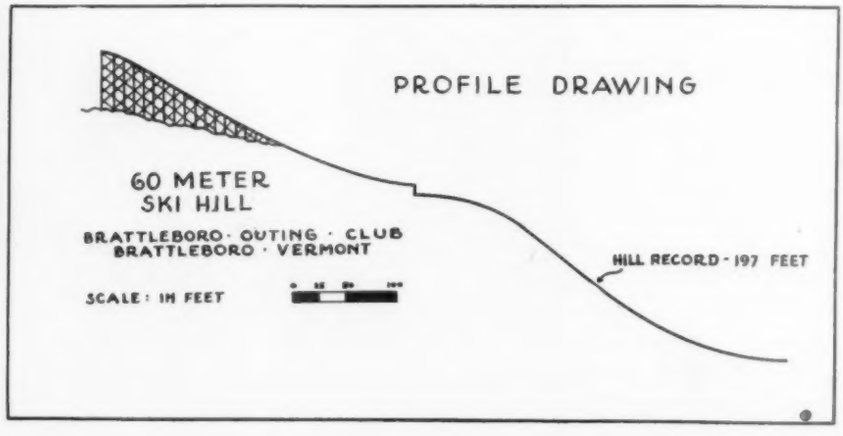
The types of inruns are either short and steep, or long and gradual. The long and gradual type is preferable because the jumper can concentrate better on form prior to the take-off. On the other hand, the approach should not be so long that it tires the muscles of the jumper. In other words, it should be long and steep enough to gain the necessary speed with a uniform acceleration. The inrun should not be as steep as the landing slope. Also, the ascent about 10 yards before the take-off should ease off gradually and merge smoothly into the gradient of the take-off. The minimum width of the inrun should not be less than 8 feet, and wider if possible, so that a jumper may make his own tracks if he wishes. Be sure there is a good base of snow on the inrun, as a matter of safety.

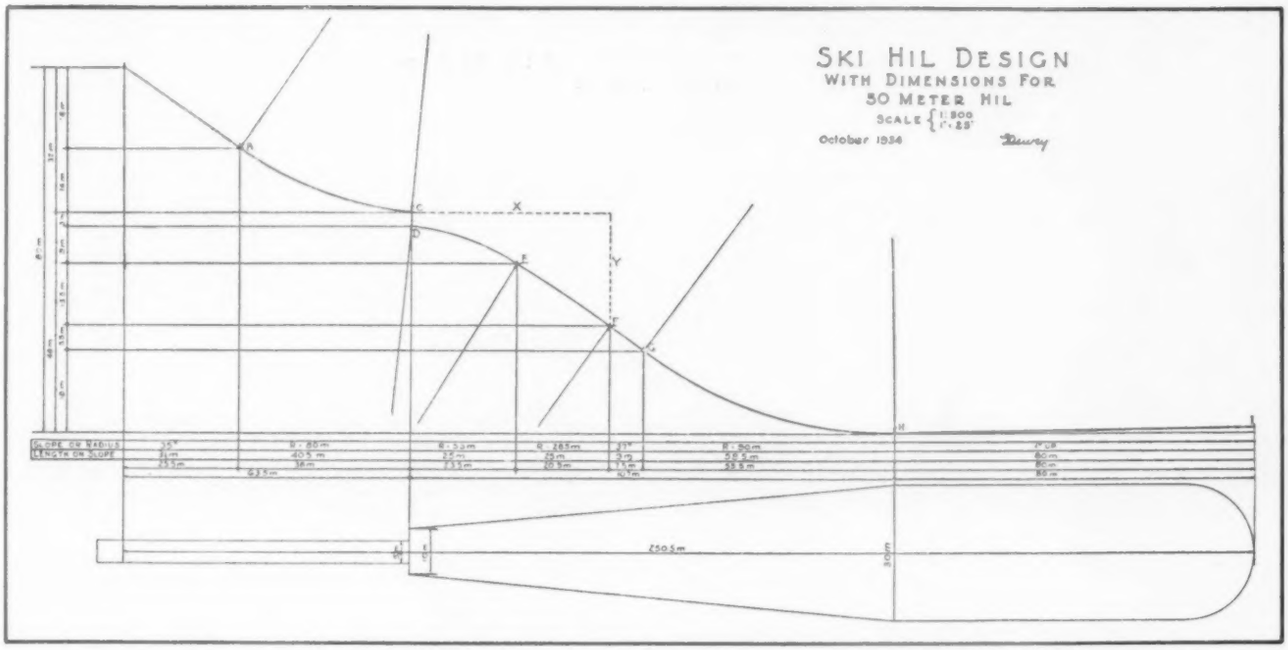
Where an artificial inrun must be set up, the inrun should be a rather steep (35 degrees) grade from the top, leveling out gradually to the take-off itself.

A tower, substantially built, is desirable at the top and may vary in height to fit the individual hill. Supports must be firm and preferably set on concrete. In some cases tree trunks have been used with satisfactory results, but be sure to remove the bark. The platform on top should be at a minimum, 6 by 8 feet, and larger where feasible. A piece of iron, 1½ inches by 1 foot, fastened on the platform, on which the skiers may scrape the snow off their boots before putting on the skis, is a distinct asset. There should be a 3-foot rail around three sides. It should extend down both sides of the scaffold and should be boarded up as high as possible, at least 2 feet: one foot to hold the snow; the rest of the space could be filled with chicken wire. Steps on both sides of the jump help both jumpers and spectators to ascend the hill.

On the inrun itself cleats should be placed at 16- to 20-inch intervals. These serve to hold the snow in position. Boards forming the inrun are laid parallel

Picture and profile drawing of the Brattleboro Outing Club's jump at Brattleboro, Vt.—one of the best jumps in the country





From "Ski Hil Design"—By Godfrey Dewey

to the runway with cross cleats. In some instances cheap slabs, with the bark still on, are laid crosswise and help hold the snow without cleats.

Above all, be sure that the inrun is long and steep enough for long jumps even under poor snow conditions.

The Take-Off

Eight to nine feet should be a minimum and this should be widened if possible. The height of the take-off should be proportioned to the slope and the acceleration derived, and should be high enough so that an average skier, under unfavorable conditions, will clear the bump and reach the landing slope. The height varies with the hill and with the jumper. It is usually anywhere from 8 to 20 feet, but it should never be such as to cause undue danger at the take-off. The slope to the take-off should be gradual. If the slope above the proposed take-off will not fit into the plan, build one making allowance for extra lips, so that the take-off is adjustable. This should be such that it may be altered for correction of error the first year. Jump and keep on jumping until the errors of good jumpers are evident, then reconstruct or alter the take-off according to the results obtained. Use good jumpers to reach your decision. When the snow is fast, rope off a distance from the top, thus cutting down on the height of the inrun. As a safety measure it is worthy of consideration.

Here are some different methods of constructing the take-off.

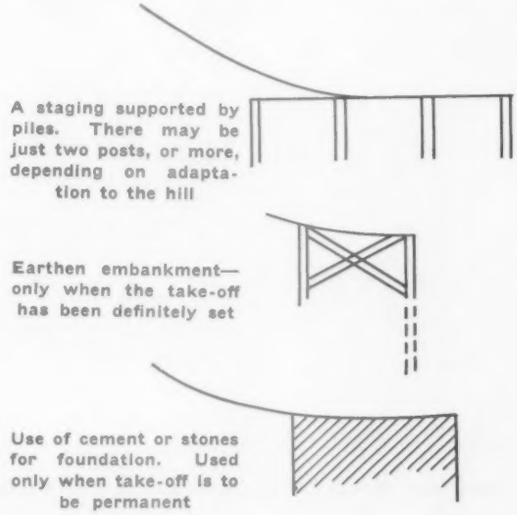
The take-off must not be too close to the landing slope, or on a fast day the men will over-jump the hill. Be sure, especially where the take-off is a part of the tower construction, that it is not too close to the landing slope.

Do not dig a hole into the hill to build the take-off, rather build the take-off out over the hill. To dig in means probable loss of air pressure for the jumper, and it is most essential that the air pressure be even all through the jump.

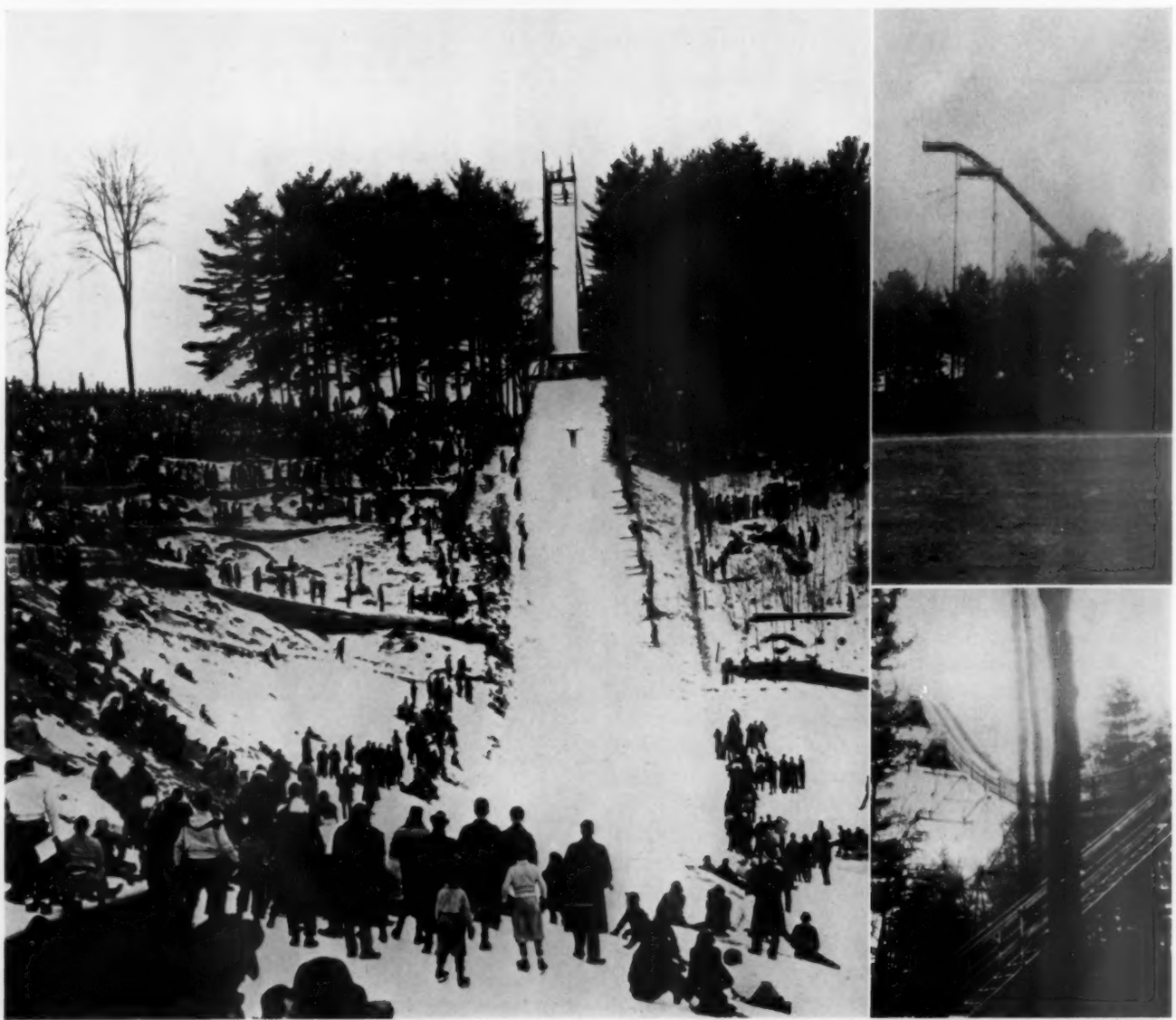
The take-off should never be set permanently until there are several years' experience on which to base judgment.

The Landing Slope

A well-designed landing slope is the most important item of a ski-jump hill. The landing slope should have ample width for safety. It should broaden out from start to finish and cannot be too wide. It should not be less than 30 to 40 feet wide below the take-off.


A staging supported by piles. There may be just two posts, or more, depending on adaptation to the hill
Earthen embankment—only when the take-off has been definitely set
Use of cement or stones for foundation. Used only when take-off is to be permanent

Construction details of scaffolding of the ski jump at Berlin, N. H.



Courtesy of P. W. Hussey, Hussey Mfg. Co., North Berwick, Maine

The Dartmouth College Ski Jump, as viewed from the landing field, and close-ups showing construction details of scaffolding

For small hills the gradient should not be less than 30 degrees, and for large hills an average slope of 39 degrees is desirable—35 to 39 degrees.

To quote from the F. I. S. Handbook:

"The jump must therefore be constructed that no matter what the distance jumped—and this is very important in the case of great distances—the alighting ground shall bear the correct relationship to the force of impact on landing."

After a maximum length jump on any hill, there must be distance enough, approximately 30 to 40 feet, for the runner to have a half-second to poise himself before he hits the outrun. A lot of work must be accomplished to grade this part of the slope to make it even so there will be no bumps, because even one little bump may be enough to cause a spill. There should be a smooth transition curve to approach the outrun. Logs or poles under the earth on steep pitch help prevent erosion.

The Outrun

The outrun should be as wide as possible (90 feet), and may be flat or horizontal and have a long run, or possess a slight uphill grade, which means that the jumper loses speed more quickly and hence it may be shorter. Under any snow condition it should be long enough to reduce the speed of jumps so that the jumper can make a sharp turn to stop without a spill. In some instances a bank of loose snow or hay may be piled up at the end of the outrun as a safety factor.

It is next to impossible to build a perfect ski jump the first time; therefore it is advisable to build so that small adjustments can be made after it has been tried out by several competent people.

Preparation of the landing slope at Berlin, N. H.

Bibliography

Brown, F. Martin: "The Theory of Ski Jumping." Ski Annual, 1935-36. Belknap Press, Bellows Falls, Vt. "The Theory of Ski Jumping." American Ski Annual, 1936. Stephen Daye Press, Brattleboro, Vt.

Dewey, Godfrey: "Ski Hil Design." Ski Annual, 1934. Bellows Falls, Vt.

Grinden, Harold A.: "Building Ski Jumping Hills." *Parks and Recreation*, Nov., 1933.

Hallberg and Muckenbrunn: "Complete Book of Skiing." Greenberg, publisher, New York City.

Harris, Fred: "Building Ski Jumping Hills." Year Book, U. S. Eastern Amateur Ski Association, 1928. Published at Association Office, Lake Placid Club, New York.

"International Ski Competition Rules, F. I. S." Grondahl and Son, Oslo, Norway, 1937.

Paashe, Bertel N.: "Hints for Junior Ski Jumpers." American Ski Annual, Brattleboro, Vt.

Schniebs, Otto: "Skiing For All." Leisure League of America, New York City.

Ing. R. Straumann (translated by H. A. Bautzman): "Modern Jumping Technique." Canadian Ski Year Book, 1935. John Lovell and Son Ltt.

Contributors

Roger F. Langley
Hjalmar Hvam
Edward J. Blood
Charles Dudley
Alf Halverson
Harold A. Grinden
P. W. Hussey
D. E. Mann
Erling Heistad
D. Bradley
James E. Flaa
Thor Groswold
Albert T. Sands
Elmer Fulton

DESIGN AND CONSTRUCTION OF SKI TOWS

BY PAUL S. PUTNAM

Landscape Architect, Greenfield, Mass.

THE tired skier at the bottom of the hill faces a climb which often seems altogether too long in proportion to the time spent in sliding. To ease his burden, a new school of ski thought has developed in recent years—the "downhill-only" skiers. To serve this new idea, the ski tow has appeared and seems to fill the bill.

Credit for the original ski tow has been given to an ingenious Yankee who strung an endless rope over pulleys and around a drum drawn by an old automobile motor. The device worked and is still with us in idea, though now greatly improved. It is evident in both Europe and America that the popularity of skiing is where tows of some sort exist.

To have a ski tow, the terrain must be large enough, and suitable, to take care of all classes of skiers. There should be plenty of open slopes and trails for the novice, the intermediate skier, and the expert. For simple estimating, if the tow delivers skiers at the top every two seconds and we can send a skier down a trail 20 feet wide every 30 seconds, there should be 15 of these trails or their equivalent to be serviced by one tow. If these are too few, they will become icy and rutted in a short time.

Next, it is very important to have good roads to and from the property. If there is anything that will work against a development, it is the possibility of one's getting his car stuck in the snow.

Types of Tows

There are four main types of ski tows:

1. The rope tow, which costs from $300 to $2,000 to construct.
2. The hanger-arm tow, which costs from $12,000 to $15,000.
3. The chair lift—from $15,000 to $20,000.
4. The aerial tramway, which is the most expensive, but will give up to 6,000 feet vertical descent instead of the 500 average in New England.

All costs are estimated, and may run in either direction, depending on the conditions under which the tow is built. Each tow seems to have its own definite place in the scheme of winter sports development.

It is possible with a tow to get in 40,000 feet of vertical descent in one day if a round trip is made every 4 minutes.

Rope Tows

The rope tow is the first chronologically, and the most satisfactory for a private club, or a school or college development limited in facilities. It is a single continuous rope device which one seizes at the base of a hill and releases at the top. It is considered the most strenuous and perhaps the most dangerous, but we have discovered records of but few accidents on well-designed and well-built rope tows. Most of the trouble came from new rope twisting and catching clothes, which, however, may be overcome by the use of waterproofed non-twist rope and a simple automatic stop placed at the top of the hill.

It is economical to construct and simple to operate. With volunteer labor it can be constructed for from $300 to $1,200. To maintain it for a year will cost $1,500 to $2,000 for gas, service and incidentals. It will be satisfactory on any hill up to 1,200 feet in length if the grade is fairly even; if not, grading will first be necessary. It is wise to place the tow so that there will be a level place at the base for skiers to catch on to the rope, and a short distance from the top of the tow to the trails so that they can take a few strides to limber up before the descent.

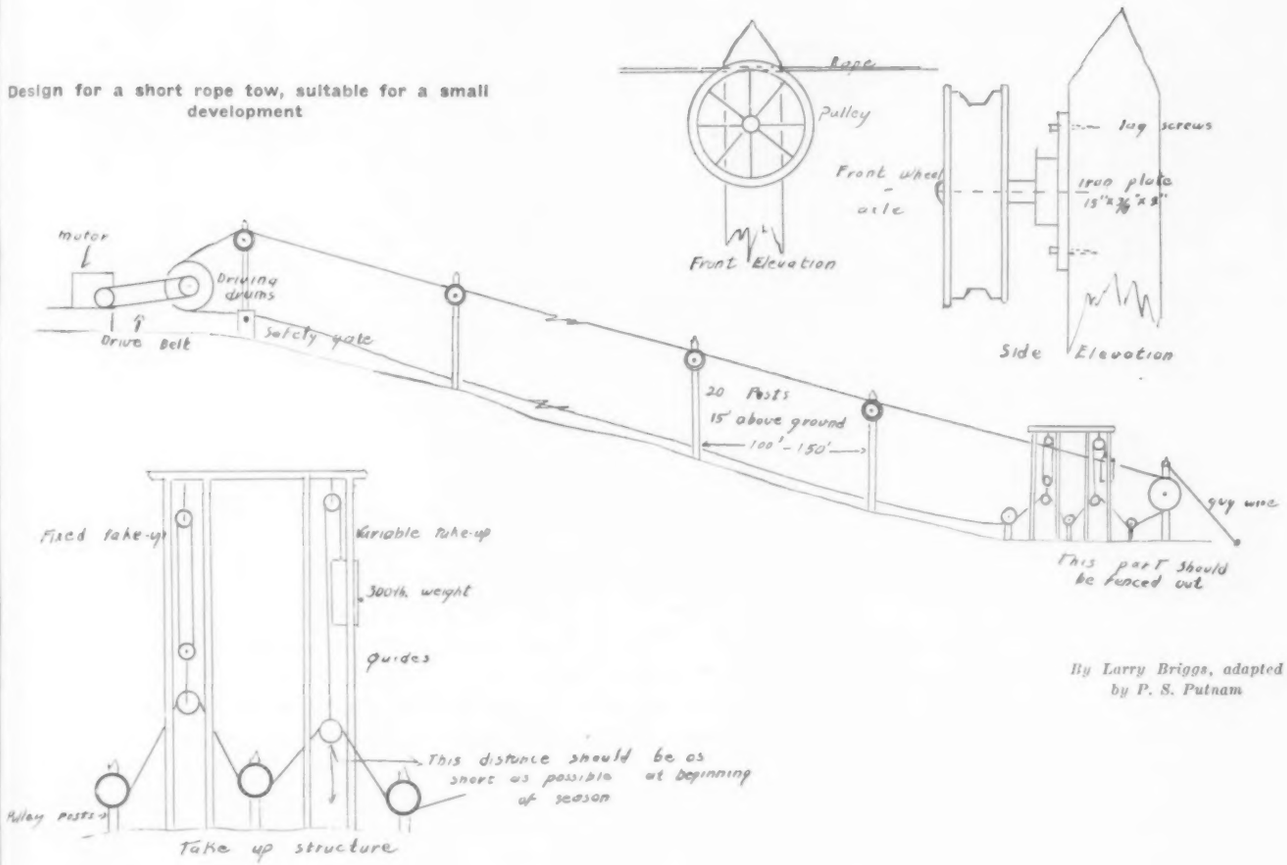
Following is a description of the construction of a short rope tow recommended by Larry E. Briggs, of Massachusetts State College, which could easily be built for a small development:

The materials required are seven or eight poles about 20 feet in length, two large timbers for the machinery bed, miscellaneous lumber for idler pulley and slack take-up structures, about twelve pulleys (center rim automobile wheels make excellent pulleys), one large 42-inch (single-groove), and two smaller 29-32-inch (three-groove) sheaves, all with grooves suitable to 1-inch rope. Also necessary are two belt-drive pulleys together with slack weight, one drive-shaft, and miscellaneous attachments.

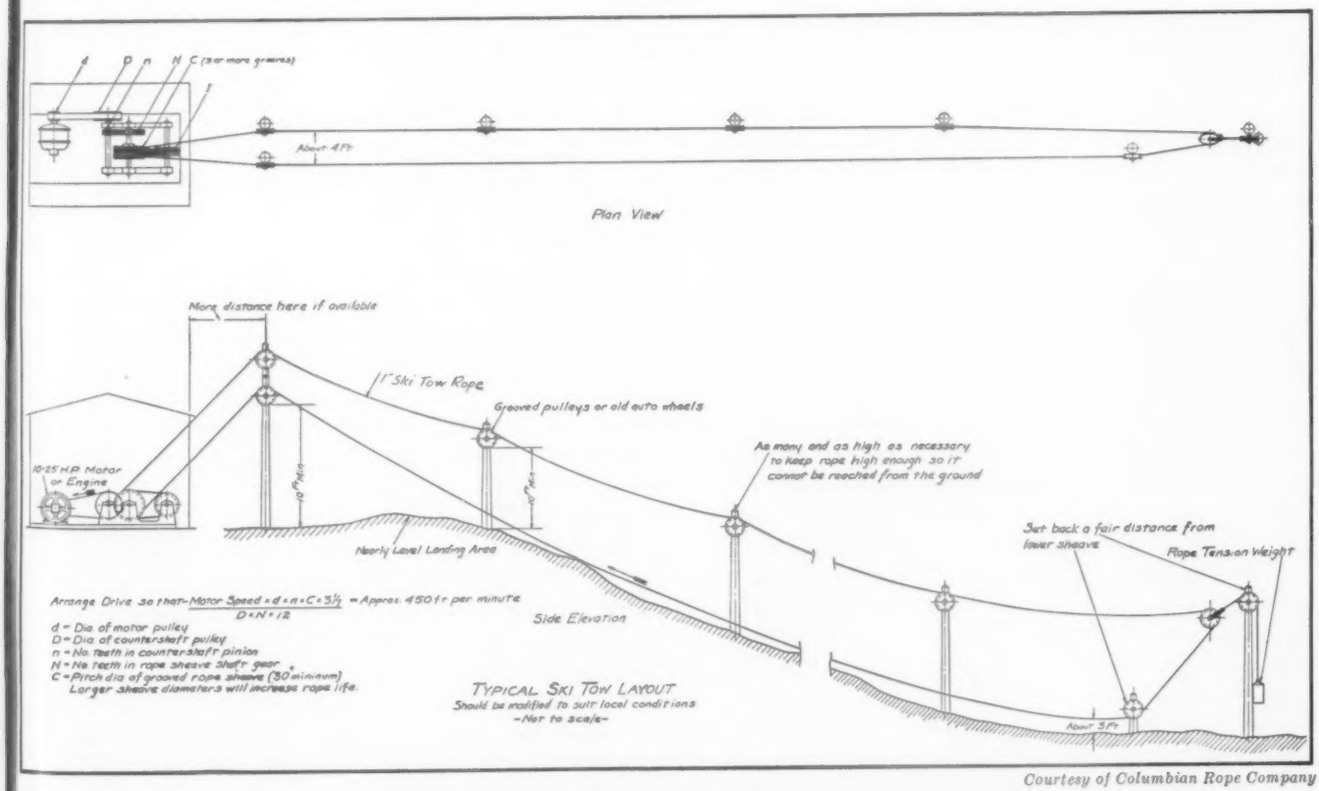
For a power plant, either an electric motor of 10-20 hp, or a gasoline motor of 20-60 hp at 1,800-2,200 rpm, may be used. A constant speed governor on engines is helpful. For power transmission one drive-belt and 1,800-2,300 feet of 1-inch waterproof non-twist manila rope will be required. Other miscellaneous materials for yokes, guides and mountings will be necessary.

The rope runs up the hill to the main idler pulley, without support, then back to the engine over idler pulleys on the top of the poles to the two driving drums. From the drums the rope travels through the slack take-up and thence through the loading station and up the hill. The three most important points on the tow are the engine and drive mechanism, the slack take-up structure and the main idler pulley and structure at the top of the hill.

Design for a short rope tow, suitable for a small development



By Larry Briggs, adapted by P. S. Putnam


d D n N C (3or more grooves)
About 4Ft
Plan View
More distance here if available
1" Ski Tow Rope
Grooved pulleys or old auto wheels
As many and as high as necessary to keep rope high enough so it cannot be reached from the ground
10-25 H.P. Motor or Engine
Nearly Level Landing Area
Set back a fair distance from lower sheave
Rope Tension Weight
Arrange Drive so that- Motor Speed x d x n x C x 3½ / D x N x 12 = Approx. 450 ft per minute
d = Dia. of motor pulley
D = Dia. of countershaft pulley
n = No. teeth in countershaft pinion
N = No. teeth in rope sheave shaft gear
C = Pitch dia of grooved rope sheave (30 minimum)
Larger sheave diameters will increase rope life.
Side Elevation
TYPICAL SKI TOW LAYOUT
Should be modified to suit local conditions
-Not to scale-
About 3Ft

Courtesy of Columbian Rope Company

A diagram showing how an average 1,000-foot ski tow could be laid out

Bousquet's ski tow gives some idea of the construction of a simple rope tow

Courtesy of Arthur Palme, Pittsfield, Mass.

Belt drive is the most-used method of power transmission, though level gears are also satisfactory. This drive should be so arranged that the ratio is such that when the engine is turning over at its most efficient speed, or the motor at its rated speed, the rope will travel at from 600 to 1,200 feet per minute. If the driving drums or sheaves are designed for 1-inch rope, and three laps are taken around each drum with proper slack take-up equipment, slippage should be completely eliminated.

A rope will stretch 5 per cent over the course of a season, and the amount of slack will vary from day to day with the weather conditions, and from minute to minute with the number of skiers on the rope. Therefore there must be a method for compensating for these changes, incorporated in the tow. The usual place for this is on the ascending side of the rope between the drums and the loading station. For this purpose, a free pulley, set in vertical guides, is inserted between two fixed pulleys and attached to a 250-pound weight. In addition to this, another free pulley may be inserted and attached to a block and tackle for a fixed take-up. These pulleys and weights may be suspended from a pole structure or tree high enough to permit the pulleys to take up the total expected slack on the rope. If this requires too high a structure, more pulleys may be incorporated.

The main idler pulley is located at the top of the hill and carries the full strain of the tow, since the engine pulls directly against the pulley to the loadline of the tow. The structure and pulley support must therefore be planned for sufficient strength to carry this load, and the pulley bearing must be of heavy-duty, smooth-running, easily lubricated type. Many operators have deemed it advisable to install a roller bearing on this pulley with a modern lubricating system.

For Safety.—A safety gate or switch should be installed at the top of the hill to prevent skiers who may become entangled or frozen to the rope from being carried into the idler pulley or rigging. One way is to stretch a line across the path at the top of the tow. Should any one go beyond safety, he would trip over the line and cut the switch on the motor and at the same time apply a brake. This is simple and effective. It is wise also to arrange fencing at the bottom of the tow, so that the people go in one at a time, and an attendant allows only one to get on the rope until the next station has come along.

Where possible, it is advisable to place the engine at the top of the hill instead of at the base. As far as power is concerned, this location is much more desirable, and it also places the operator so that he can see the length of the hill and is in a better position to watch the riders on the tow than where the power is placed at the base.

Some difficulties have been encountered where motors without variable speeds have been used. In some instances where the rope has been pretty well frozen, the motor has been cut in across the line without any compensating starter, and the rope has been broken simply by that unusually large starting torque putting a terrific strain on the rope almost instantaneously. If an automobile type engine with a transmission is used, this trouble may be avoided, since this type can be started in low and then shifted into second and high gear. This also permits the operation of the tow at reduced speed for beginners at certain periods of the day, so that they may get used to the tow.

The ski tramway at Dartmouth College is a good example of the hanger-arm type of ski tow

Courtesy of Dartmouth Outing Club, Hanover, N. H.

Hanger-Arm Type Tows

While the rope tow with its latest improvements is very satisfactory, wherever it is financially possible and facilities permit, the hanger-arm tow is perhaps a better investment. This type gives a more enjoyable ride, and is capable of longer distances. However, it must be run at lower speeds to be easy to get onto. It is similar to the rope tow in many ways, but the cable of the hanger-arm type runs in a plane horizontal to the ground, instead of vertical, and has arms welded to the cable which half lift and half push one up the hill. While the investment for this type of tow is rather high, the income is also increased, for higher rates can be charged, and the whole layout is more permanent and satisfactory for a commercial development.

A tow of this size and type requires competent engineering and design, and for that reason anyone planning such an installation should have a profile made of his hill and take that, with other information, to an engineering firm. The tow at the Rib Mountain development is typical of the hanger-arm type. This seems to be one of the types that the public desires. It is 3,150 feet long, has a vertical descent of 530 feet, and will accommodate about 700 persons per hour. Its capacity is 75 persons at one time, and they go up at the rate of 5 miles per hour (440 feet per minute).

The tow is powered by an 85-hp Ford V-8 motor with a standard truck transmission which is connected to a speed reducer, and thence to an upright 4-7/16-inch shaft, 13 feet long, with a 6-foot diameter drive-sheave at the top. This drive-shaft and sheave is set in a steel drive tower at the top of the hill. At the bottom of the tow there are two steel towers, one stationary with sheaves over which a cable runs from a 2¼-ton weight to the movable tower. In the movable tower there is another 6-foot sheave around which the tow cable runs. This system works very well for slack take-up.

Between the upper and lower towers there are 25 hemlock posts, 14 to 18 inches in diameter. Twelve feet from the ground level there is placed a 2½-inch pipe cross-arm on the end of which is a roller assembly of two wheels on an axle plate, with a guide-plate to guide the hangers through. There are 155 of these wooden L-shaped hangers clamped and welded onto the cable. A telephone connects the two buildings on each end of the tow.

This type of tow can be run to great lengths.

Chair Type Tow

The chair type tow has proved very popular where it has been used. It is similar to the hanger-arm tow, except that seats replace the arms. These make it a little more comfortable than the hanger-arm type. As it takes practice to get into the chairs, this type has to be run relatively slowly at present. Some operators have attempted to run the chair tows at a very fast rate, but stopping to allow each person to get on a chair. This has been unsatisfactory for several apparent reasons. The best method probably is to group the chairs somewhat, so as to give long distances between stops.

Aerial Tramways

While an aerial tramway is not applicable to most situations and does not actually come within the scope of this study, it has been used in the past, and undoubtedly will be in the future. An aerial tram-

The Cannon Mountain Aerial Tramway, showing the tramway car leaving Valley Station, at Franconia, N. H.

way has been completed at Franconia Notch, N. H., which gives a 5,410-foot suspension ride in every type of weather. It will be used as a scenic ride in summer, and as a skier transport in the winter.

The construction consists primarily of two large cables, along which cars will move at the rate of 1,000 feet per minute. It uses various braking devices, the principal one of which is a device which grips the cable.

A tramway such as this is a commercial investment for the development of year-round use. It is independent of weather conditions. However, it is valuable only in certain situations, and is quite expensive.

In Conclusion

Anyone interested in constructing a tow should make a careful survey of the facilities of his location, with the idea of building to suit future use. If it is feasible, build one of the more permanent and advanced types of tows, for, as we mentioned before, skiers are now looking for more ease and rest on the return ride. If the popularity of the development is doubtful, build a rope tow for current use, and as an experiment. In the future we are going to see more and more hanger-arm and chair types, with the emphasis probably on the chair type, particularly if its delivery can be speeded up.

There is a definite need for tows. A questionnaire sent out to a number of ski experts in New England and New York on whether a tow is an important adjunct to any ski area brought the result overwhelmingly in favor of tows. However, it was stressed that tows should service open slopes rather than trails.

Many of the skiers using tows in the past have been college students. Several colleges, including Williams and Dartmouth, have erected ski tows. Williams has a rope tow on Sheeps Hill, and Dartmouth has a hanger-arm. It is conceivable that Physical Education Departments or Outing Clubs of other colleges will soon incorporate tows in their equipment and make them self-supporting.

References

Briggs, Larry: "Construction of an Inexpensive Ski Tow with Rope Hoist." W.M.W.S.C. Bulletin No. 33, December 12, 1936.

Buck, Allen: "Now It's Tow Heil." *Boston Traveler*, February 24, 1938.

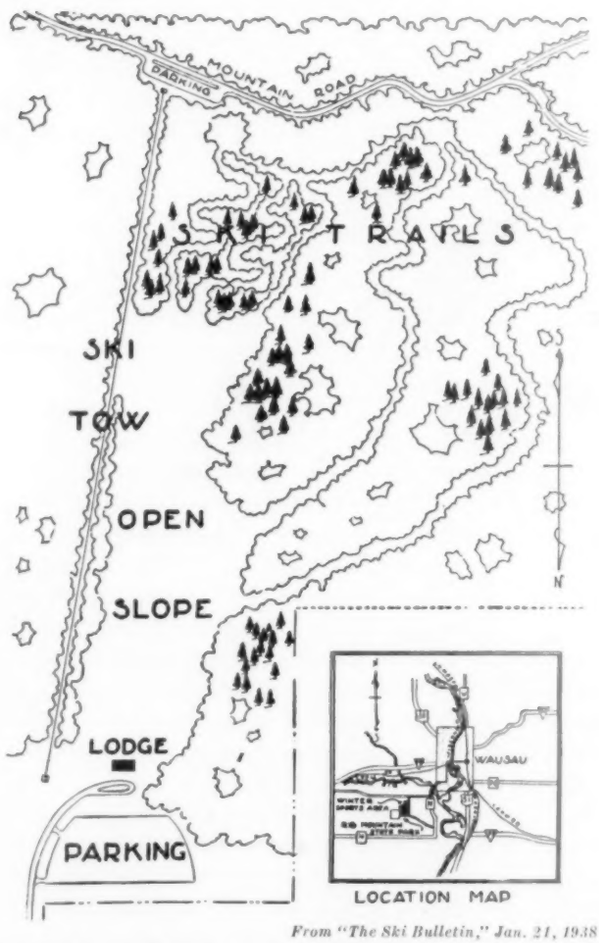
Golner, Lester: Article on Rib Mountain Tow. *The Ski Bulletin*, January 21, 1938.

Pabst, Fred: "Ski Tows." From notes on meeting of Adirondack Mountain Club, Albany, N. Y., December 4, 1937.

Russell, S. G.: "Suggestions for a Successful Ski-Tow." Folder. Columbian Rope Co., Auburn, "The Cordage City," N. Y., June 11, 1938.

Richards, W. H.: "America's First Aerial Tramway." Cannon Mountain Aerial Passenger Tramway, Franconia Notch, N. H.

Collins, C. I.: "The Ski-Chair Tramway." American Steel & Wire Co., Worcester, Mass.



From "The Ski Bulletin," Jan. 21, 1938

The Rib Mountain State Park Winter Sports area is a typical development showing how a ski tow should feed open slopes and ski trails

ICE SPORTS AT SCHOOLS AND COLLEGES

BY RUSSELL L. SNOW

Boys' Supervisor, Leake and Watts Home School, Yonkers, N. Y.

ICE sports make a definite contribution to a physical education program at schools and colleges where good facilities are available. Skating requires skill, stamina, and excellent coordination. Professional hockey, public skating areas and artificial ice rinks have helped to popularize ice sports in recent years, and in many schools and colleges the student demand for this type of activity has been one of the reasons why skating areas have been maintained despite the difficulties and expense involved.

The numbers participating in ice sports are small because facilities are often not adequate to handle large groups, and intramural ice sports are impractical under existing conditions in many schools and colleges. Maintenance or rental of proper facilities is costly, and the sports use of either natural or artificial ice is an expensive item of the budget. Recent developments, however, in types of facilities and their proper care and maintenance have tended to increase the popularity and practicability of all kinds of ice sports.

When an Ice Sports Program Is Feasible under Natural Conditions

1. The institution must be located geographically where weather conditions permit a reasonable season.
2. An excellent rink location must be readily available, preferably with capacity for holding water, at a high altitude, sheltered from the sun.
3. There must be adequate financial support for the maintenance of facilities.
4. The facilities should allow comparatively large numbers to participate.
5. There should be adequate equipment and means for clearing the ice, making a new surface or rebuilding an old one.

Weather conditions are favorable for maintenance of ice-skating facilities under natural conditions only in the northernmost states—approximately north of an imaginary line of latitude drawn through the Massachusetts-New Hampshire state line. The number of days cold enough for ice-making south of this line is very small, although covered facilities, eliminating the snow, rain and sun factors, increase the number twofold. The best ice season, for natural conditions, all weather factors considered, extends from January 15 to February 12.

Natural Skating Areas

Several types of natural skating areas are available to the majority of institutions.

Small ponds are the most desirable for the development of all the features essential to a well-balanced ice sports program.

Rivers and streams are often available, the coves and adjacent flood lands of which may be used, but they are generally dangerous owing to the uneven thickness of the ice and because of their treacherous currents.

Swamp lands or flooded lowlands are often used successfully for skating surfaces and have many advantages. The fact that they are shallow is a great safety factor. On the other hand, the water-level of some of these natural lowlands is not constant, and receding waters may leave the ice without support; or flood waters may spoil the ice surface, although oftentimes these can be controlled by ditching out or damming.

Built-Up Outdoor Skating Areas

Any level land area which will hold water and on which a surface of ice can be built up may be adapted to the construction of a rink and will be safe and easily maintained. Tennis courts are often used to good advantage for rinks, although they do not always hold water satisfactorily. Playing fields are sometimes used in this way. An excavated area may be flooded a little at a time until it is covered with at least two inches of good, solid ice. A shallow depth of water will freeze and stay frozen much more readily than a deep one on an excavated area. Provision should be made by ditching or pipes to keep the water level constant in case of excess of ground water, rain, or flooding. The open playing field must be banked with earth or slush before flooding, and the same precautions should be taken as with the excavated area.

Maintenance of Established Rinks

Building Up an Ice Surface:

The surface should be sprayed—not flooded with a heavy stream of water. Heavy streams of water from underground or inside sources ridge or groove the surface.

Before spraying, the surface should be brushed clean.

Spraying is done best in the evening. It may be started as soon as the ground is frozen and the temperature reaches a constant of 28 to 30 degrees F. Do not spray when the wind is southerly or easterly; ordinarily, a northerly or westerly wind indicates more favorable weather for freezing.

There is a technique of spraying that makes the work easy and results in the most satisfactory completed surface. With the wind at his back, the operator should start at the far end of the rink and work toward the water supply. He should carry the hose over his shoulder and swing it from side to side in an 8-foot arc. A fine-spray nozzle held at about a 30-degree angle to the surface gives the best results. Zigzagging back and forth fast enough to match water to water, the operator should cover the whole rink strip by strip so that there will be no difference in level.

There should be one man ahead of the sprayer filling holes with a mixture of snow and water and leveling off bumps with a heavy iron shaver. Large cracks may be filled with hot water, or, where hot water is not available, cold water may be poured in with an ordinary watering pot.

The rink should not be used in warm weather, since in such case the surface would be entirely ruined.

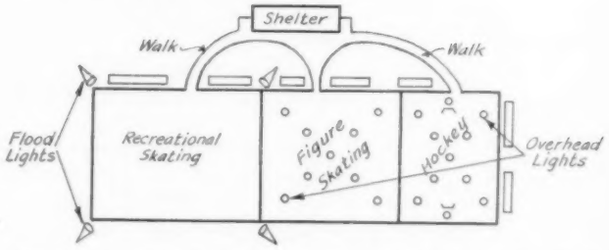
Snow Removal and Ice Scraping:

Snow should never be removed while it is still storming. Snowstorms turning to sleet and rain will ruin an ice surface, while underlying snow will protect it.

Snow that has been removed from a rink should be deposited as far away as practicable, to provide room for removing more snow and to prevent flooding of the edges of the rink during a thaw.

Snow-removal equipment should include ice scrapers, powered and hand scoops, and brooms. Among the many types of ice scrapers, the most practical for large areas is the heavy-duty horse-drawn or machine-drawn scraper. Every rink should be provided with steel or steel-edged hand scrapers for the removal of light snow and ice chips. Specifications for satisfactory snow-removal scrapers may be obtained from the "Winter Sports Instruction Guide," published by the Massachusetts State Department of Education, State House, Boston, Mass.

Methods of snow removal vary with the amount of snow and the type of scraper used. In general, to save time and effort, use the minimum distance of travel. The two diagrams at right show, first, the method of removing heavy snow, and, second, the method of removing chip ice to prepare for scraping or between the periods of a hockey game.



Rough sketch of a satisfactory layout for an outdoor rink

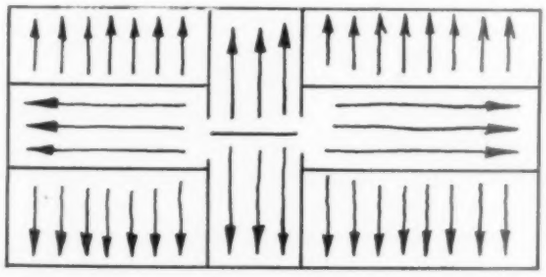
Facilities for Natural-Ice Uncovered Rinks

The ideal uncovered natural-ice rink should have facilities for all types of skating—recreational, figure and hockey. Lights are almost a necessity, for oftentimes temperatures are much more favorable for skating at night. Floodlights at the side of the rink should be used for free skating, while overhead lights are best for the hockey rink or the figure-skating area.

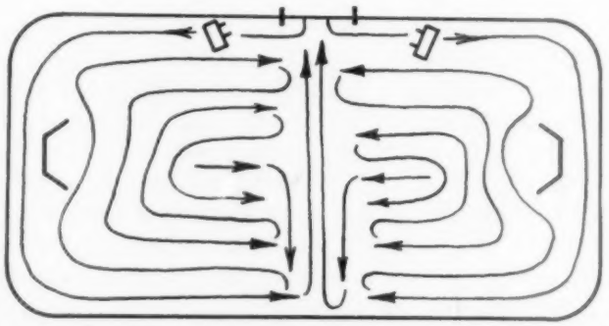
There should be a shelter adjacent to the rink, not elaborate, but providing the essentials for the comfort and convenience of the skaters and for storing equipment.

Natural-Ice Enclosed Rinks

Covered rinks or skating areas for colleges and schools anywhere in the northern states are recommended where finances permit. Several precautions should be taken, however, in the construction of indoor rinks. In the first place, it is necessary to know that the ground surface covered will hold water. In



Any number of operators using large metal-tipped wooden scoops to remove heavy snow



Two operators using heavy iron 4-foot scrapers pitched at angle to remove chip ice

Left—A snow-plow
Courtesy of Toro Mfg. Corp.

All these photographs show machines which may be used in summer for mowing purposes and in winter for removing snow on skating areas and elsewhere about the campus

Above—A heavy-duty scraper being used in a large rink
Courtesy of Worthington Mower Co.

Left—An ice planer in use on an outdoor rink
Courtesy of Toro Mfg. Corp.

the second place, there must be an excellent system of ventilation. Both the top and the bottom of the structure should be built to allow a free circulation of air between the inside and the outside. Third, there must be a high ceiling allowing a large enough air space to insure the maintenance of favorable temperatures indoors.

Hamilton College, at Clinton, N. Y., and Dartmouth College, at Hanover, N. H., have enclosed hockey rinks with natural ice.

The Hamilton College rink, officially known as the Sage Building, which cost approximately $130,000, is used for skating from December through March. The ice is used for physical education classes for fundamental skating and recreational hockey from 8:30 A. M. to 3:30 P. M. Hockey teams use the ice from 3:30 P. M to 6:00 P. M. The 220-yard cinder track surrounding the ice surface is used during the winter for physical education and also by the track team squad. The dirt surface of the rink is used in the fall for physical education classes, soccer, speed ball, softball, and sometimes for running signals, etc., by the varsity football team. There is practically no use for it during the spring, because the ground does not dry out enough.

The building is rectangular, 116 x 229 feet. In addition to the 229 feet, there is a semi-circular extension of 72 feet to the rear to take care of the 220-yard track. It is constructed of local stone to conform to the other buildings on the Campus, with steel trusses, and steel sash for the windows. The north side is entirely glass, the south side has no glass, and the east and west sides have glass in the gable ends above the balcony level. It is entered from the balcony level, which is the area for spectator stands, and the track runs under these balconies.

There are toilets in the building and a small plant for heating water for sprinkling the surface of the ice. On the south side there are louvered openings in the wall to afford cross-ventilation during the freezing periods, and at the west and directly connected with the rink there are doors at about the height of the bulkhead to dispose of surface scrapings during the games.

At present there are no facilities for artificial ice-making equipment. The principal difficulty that has arisen regarding ice is that it does not melt soon enough in the spring to make the building available for spring sports.

The exterior of the Dartmouth hockey rink is built about the arch roof type of construction. The exterior walls are brick of Colonial design, to harmonize with the Dartmouth scheme. The roof is of wood and tar and gravel, steep pitch type.

The interior is lined with insulating board. The side galleries slope to the ice floor surface, which is of cinders. At one end there is a wide entrance to accommodate vehicles used for snow removal, and other equipment; at the opposite end there is a vestibule with ticket offices and an approach to the galleries.

Dormers were put in the roof to break up its tremendous mass, and also to help in freezing. All windows to the south are paneled with stainless steel in place of glass, all light coming through the windows to the north.

The building seats 1,715. It has no special equipment, since it depends on natural ice, controlling the temperature by opening and closing the windows. There are two small dressing rooms heated by oil stoves. The rink is used only for varsity and hockey games and practice. The maintenance figures show that it costs between $1,000 and $1,300 per year for labor, water, lighting, etc.

Artificial-Ice Rinks

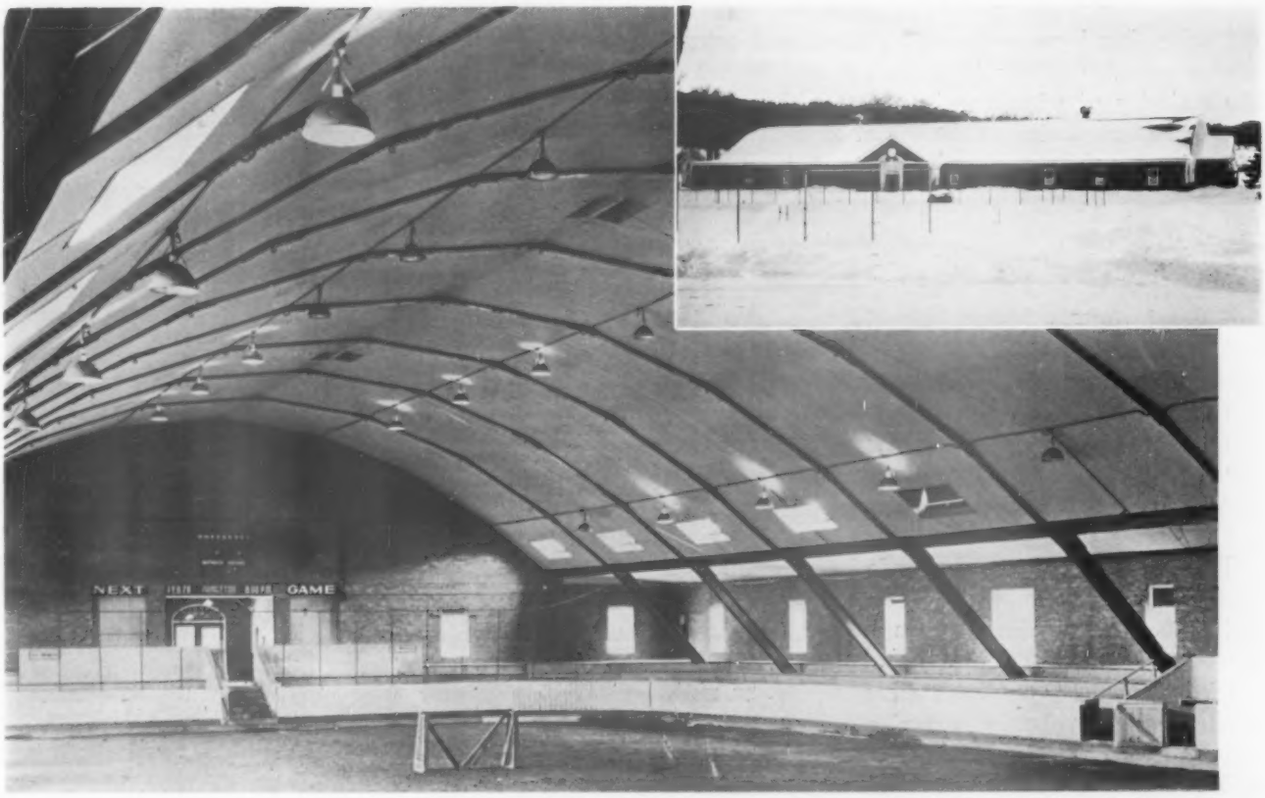
Artificial-ice rinks are increasing in number and seem to assure ice sports a place in the physical education program of many schools and colleges, besides providing for public skating and club hockey. Several institutions have recently invested in artificial-ice rinks of their own.

Notable among these is the rink built at the United States Military Academy at West Point at a cost of approximately $151,000. This is a semi-closed type of skating arena. The building is 240 x 110 feet, and the unusually large ice surface is 232 x 90 feet, allowing a separation into different areas for different types of skating.

The floor is of 4 inches of reinforced concrete covered with ½-inch of sand and cement. There is no waterproofing or insulation in the floor. The refrigerating pipes are encased in the concrete in its lower portion and are supported on a channel grooved to receive them, which is laid on small concrete blocks 8 x 8 x 8 inches spaced at intervals. The floor itself is supported by small concrete posts with smooth lubricated tops. The floor was poured in one piece, and is without expansion joints but free to expand in all directions. The floor and pipes rest on 6 inches of sand. Steel pipe, uncoated, was used. One-inch diameters are laid on 5-inch centers. There are over 60,000 feet.

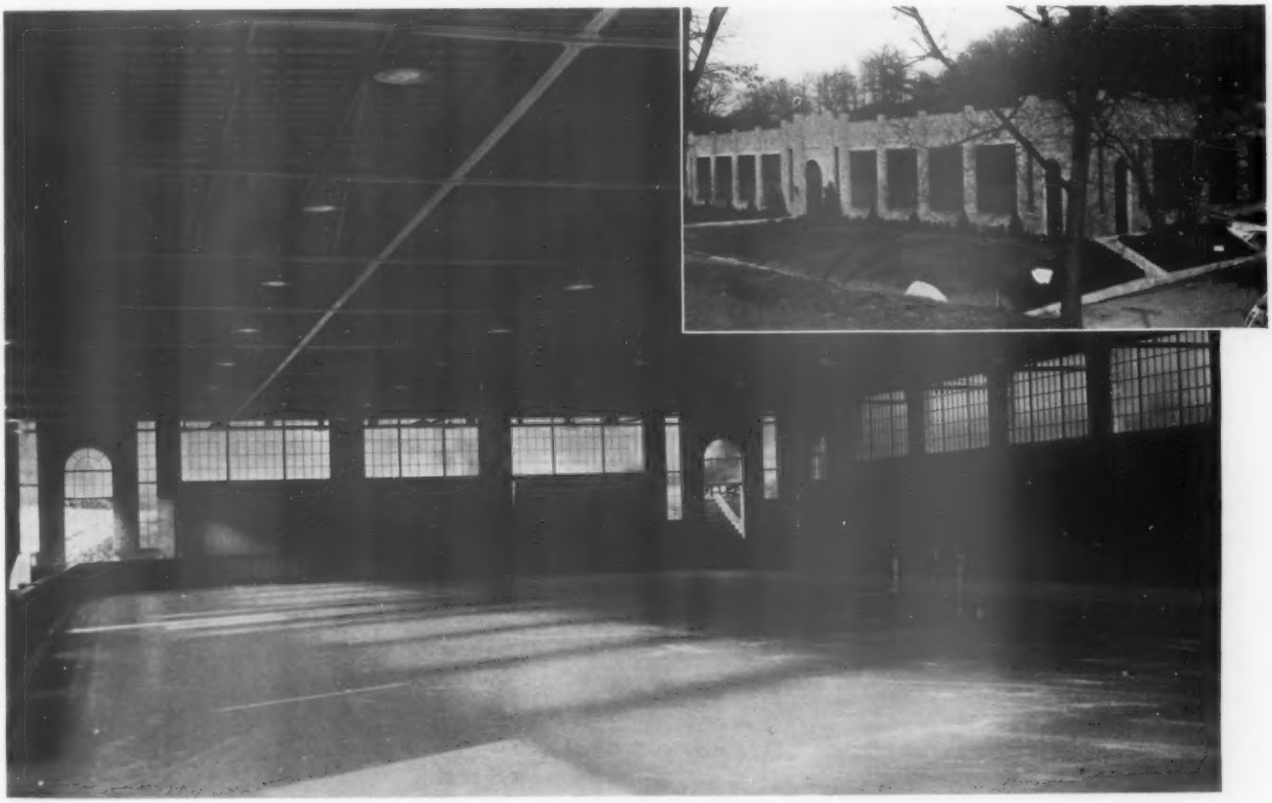
The ice surface is larger than is necessary for a standard hockey rink, but the building was not designed to accommodate a large group of spectators. The cost of operation, including salaries, furniture and fixtures, supplies, electricity, fuel oil, repairs and painting, is from $10,000 to $12,000 a year.

There is a very definite trend toward the construction of these quasi-covered rinks in Europe and England.



Inset, courtesy of Arch Roof Construction Co.; interior, courtesy of Dartmouth College Athletic Council

The Dartmouth College hockey rink is an excellent example of a natural-ice enclosed rink



The United States Military Academy at West Point, N. Y., has an artificial-ice rink of the semi-enclosed type

Skating Games and Sports

Hockey has become a well-regulated and popular winter sport. Outdoor facilities are still in use by the majority of schools and colleges, although more each year are turning to the use of covered artificial ice. Shallow rinks seem to be the most popular type, and high boards are used in the majority of cases and are definitely best suited to the game.

All hockey equipment has been standardized, and its use is subject to the financial limitations of the individual club or institution. No team should be put on the ice without adequate protection for the players. This consists of shin-guards, cup and supporter, padded pants, elbow and shoulder pads, for the forwards and defense; and chest protector, shoulder pads, padded arms in front, heavily padded gloves, football pants, cup and supporter, and heavy leg pads, for the goalie.

Hockey programs should include intramural as well as interscholastic competition. Institutions owning indoor facilities lead by far in the development of a well-balanced hockey program.

Figure skating is an art that has been taken up by an increasing number of enthusiasts, and lends itself readily to a physical education program of teaching skills. Small groups can be given instruction in its fundamentals, and a great deal of time can be spent enjoyably and profitably in this recreation.

School figures are laid out by the United States Figure Skating Association and are graded into eight tests in their order of difficulty. This sport should be encouraged among schools and colleges and should form a part of every carnival program. Special skates are needed for this type of skating, and there should be a special area provided for it, eliminating interference from other skaters.

Free skating is performed by each skater with the entire ice surface of the rink at his disposal. This type of skating can be used to good advantage to develop poise, carriage and rhythm, and is judged on this basis. It makes a colorful part of a carnival program.

Speed skating is entirely different from the types already discussed and yet is suitable for certain kinds of skating programs. Schools with the proper facilities will find that it makes up an important part of their carnival programs.

A classification of events for a speed skating contest can be found in the official handbook of the Amateur Skating Union of the United States. Different classifications and adaptations can be made from this material to fit the particular school carnival or program desired.

Winter carnivals have come to be outstanding affairs in the social school life of an increasing number of northern institutions, and they certainly would be incomplete without a full program of skating sports. A suggested ice carnival program would include general skating in costume, general waltzing, figure skating, grand march and award of costume prizes, comic skaters, group skating or drill, barrel jumping and games, crowning of carnival queen. Lights and sound equipment would be necessary at night to make such an affair a success.

Skates suitable for the user should be provided, and on this point it is advisable to seek the opinion of someone familiar with the different types. Racing skates, figure skates and hockey skates differ a great deal in construction, and the types are not interchangeable.

Safety

Safety should be a very important consideration in the construction and maintenance of ice-skating facilities. It has often been subordinated or entirely neglected.

First and foremost, there must be adequate supervision to prevent accidents due to cross traffic games and misuse of equipment.

Areas should be set aside for the various types of skating and for different-size children.

Skating areas should be marked to indicate the condition of the ice. All dangerous spots should be flagged, and no one should be allowed on soft, honeycomb or thin ice. Where deep water lies below the ice, there should be ladders, poles, lifebuoys and ropes available, or in the case of running water, a boat with oars.

A receptacle should be provided to keep refuse off the ice. Many a bad fall has been caused by a small piece of cloth or paper that has been left lying on the skating surface.

The buddy idea should be put into practice when a large group is skating on a deep-water area. First-aid equipment should be kept available, and a telephone close by may be the means of saving another life.

Safety should be the first consideration of any institution maintaining a program of ice sports.

SKI SHELTERS AND LODGES

BY WALTER KIMBALL MITCHELL, JR.

Graduate in Landscape Architecture, Massachusetts State College

SKIING is sweeping the country. Its rapid growth has left us far behind in the matter of adequate accommodations for the skier. This is true of schools and colleges and government agencies, as well as many private club developments. When the skier is not actively using the ski trail, his primary interest is comfort, and this he should find in the ski lodges or shelters.

It will not always be possible, from an economical standpoint, to place ski shelters where they would be ideally located for winter sports, or to construct them for their best possible use.* If the skiing season were a comparatively long one, as in northern New Hampshire and Vermont, it might be advisable to build ski shelters for the use of the skiers only, since their number is rapidly increasing. The fact remains, however, that the small amount of snow that has fallen in western Massachusetts, for example, in the past three years does not warrant the construction of buildings for the limited use of skiers only.

As to the type of future construction of ski lodges and shelters for all-year-round use, it should be emphasized that the skier's first interest is warmth and rest. If temporary facilities for drying and waxing can be offered, so much the better; but, even though a warm resting place be the only facility offered, it is enough to warrant the building of ski shelters. These may of course be designed for year-round recreation —and this is highly desirable.

If there is need on any area for an administration building as well as a ski shelter, the two may be combined, as at the Pittsfield State Forest. If it is possible to make a road to a location where a building planned for administrative use can also serve the skiers to best advantage, such a building will be welcomed. Often, facilities can be added without interfering with the dual purpose of the building. If it is not feasible to locate it near skiing terrain, it will still be satisfactory, for the average skier is usually willing to cross-country ski to and from the warming center. When, however, there is no shelter at the top of the slope, the skier often has to put on his high-speed wax in the cold air. The distance from the first aid station in the shelter to the trails in case of accidents must also be taken into consideration. It is obviously better to have some place to which to take the patient than to have no such facilities. Lodges with over-night provision should not be built if there are lodging houses or hotels within a reasonable radius.

There is also the problem of the stealing of ski equipment. There has been little stealing of equipment from shelters located away from the road and especially from those at the top of the trails. This indicates that the general public is responsible for most of the stealing of ski equipment, and not the active skier.

Requirements for the Good Ski Shelter or Lodge

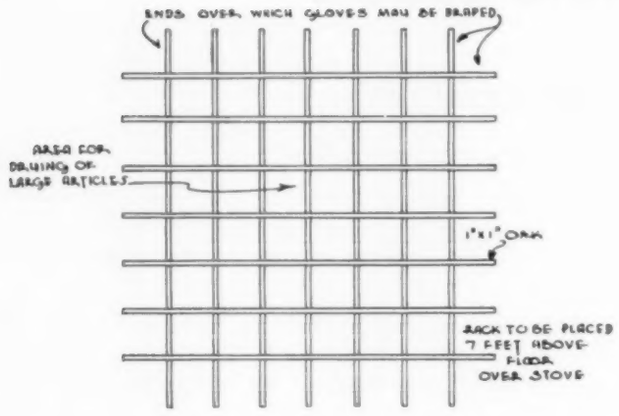
Orientation.—Whenever possible, the ski building should have a southeast or southwest exposure, with the maximum window area on the south side. A windbreak on the north side helps to preserve heat. Nearness to a parking space has little bearing on the location of the building, for a short cross-country hike on skis tends to get one in condition for the trails and also adds interest to the day's activities.

Architectural Style.—The architecture should fit the surroundings, and may sometimes be over-sized to give the effect of ruggedness. The plantings around the structure should resemble the natural woods in which it is located, and should be agreeable to the eye. All sides of the building should be pleasing to look at. It should be painted either a warm brown or a light gray for natural effect. Low-pitched roofs blend the structure into the landscape; though they are more pleasing, a high-pitched roof sheds snow more easily. If rock work is used, it should be natural, irregular, and horizontally lined, and be composed of a variety of sizes of rocks. Logs should be knotty and peeled. It is often necessary to have the texture of the roof as heavy as the walls to give a balanced effect.

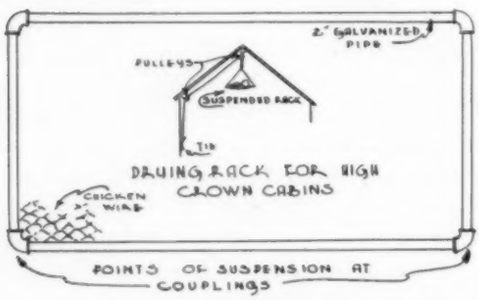
Facilities.—The National Park Service in "Park Structures and Facilities" gives the following essentials of a shelter: overhead protection; a place to sit in and rest; fireplaces; partial or complete enclosure; provisions for cooking; and toilets. A ski shelter, however, has certain necessities that an ordinary shelter need not include.

The first of these is the *double-style doorway,* especially in the entrance to the waxing room. A *vestibule* prevents the escape of heat and may include a ski rack. It also provides a place to leave boots when the Dutch system is used.

* From a statement by Raymond J. Kenney, of the Massachusetts Department of Conservation, at a meeting of the Western Massachusetts Winter Sports Council.


ENDS OVER WHICH GLOVES MAY BE DRAPED
AREA FOR DRYING OF LARGE ARTICLES
1"x1" ORN
RACK TO BE PLACED 7 FEET ABOVE FLOOR OVER STOVE

DRYING RACKS



Courtesy of Harry L. Blaisdell

Fig. 1 (Top)—A compact drying rack can be made by nailing wooden poles together

Fig. 2 (Bottom)—Chicken wire stretched across pipe makes a useful drying rack

An often neglected but highly important feature is the *waxing and repair room.* The floor may well be covered with fiberboard, for ski boots will disfigure it. A hard-packed sand or peastone floor is economical and practical. The room should be heated, preferably with a long, low laundry stove, which gives the maximum heating surface for ski-warming. At Sun Valley, Idaho, this room has tables featuring a center section for wax, flatirons, wire wool, etc., and placed so that one person can work on each side. There are uprights on each end of these work-benches which hold the skis comfortably so that the bindings do not rest on the bench. The repair room may well have a carpenter's work-bench and a cabinet of tools. If there is no other provision, an inexpensive shed or outbuilding, heated, may take care of the waxing.

Another requisite of a good ski shelter is a *drying room,* which can be combined with the waxing room—or perhaps the main room may be used for this purpose. A row of hooks high up in the main room may be used for hanging clothing and boots to dry; or a wooden rack made of inch-square stock may be raised and lowered by pulleys either in the center of the room or above the stove. This design (see Figure 1) offers the maximum hanging space, yet is compact and can take care of 28 to 38 people.

Water Supply.—This is a very important facility. A bath or shower is quite essential for a lodge, but is not necessary in a shelter. A hot-water stove or heater will always be prized, as will a bubbler in the main room. Care should be taken to cold-proof the water system. Toilets are a necessity and should be separated by at least one heavy wall.

Heating.—Provision for heating the lodge should begin with the construction of the building, making the walls air-tight. With log cabins, it is well to have the logs flattened on two sides. They should be cut and barked at least six months prior to construction, to allow them to dry out or pre-shrink. A wire or wire mesh between the logs will hold chinking material, which is added after construction is complete. The floor can also be cold-proofed by laying tarpaper under the boards. The more heat lost, the more wood to chop!

The following heating methods, or combinations of them, are recommended: chunk-stoves; fireplaces (with Heat-o-Meter heaters); old-fashioned open-front Franklin stoves; and wood-burning hot-air furnaces. For the one-room ski lodges, the cupboard style bunks (see Shurcliff's design, Figure 6) are very good, and keep the main room warm all night.

Protection of Ski Equipment.—Besides the protection obtained through judicious location of the shelter, padlocks, obtainable at the concession, prevent the borrowing of ski equipment. A system of checking skis has also proved of value. The Sun Valley ski racks consist of a base tray with brackets about 5 feet up on the wall, with an open front. These can be swung around and padlocked if desired. The space between the brackets is sufficient to hold two pairs of skis and ski poles. Where there is no special space for a ski rack (as in the waxing room), it is possible to have brackets and a base pan in back of the benches which line the walls of the main room. Padlocking would not be necessary in this case, because the skier could watch his own equipment while warming and resting. (Figurs 3 may be of value in building a ski rack.)

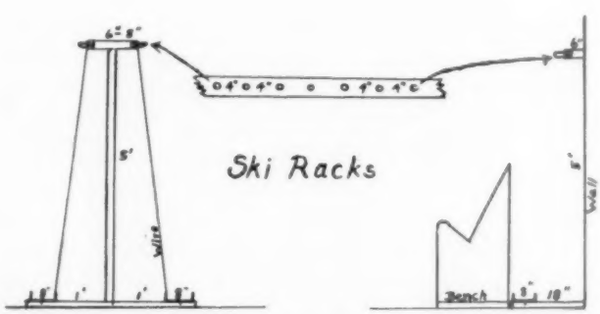


Fig. 3—Two types of ski racks

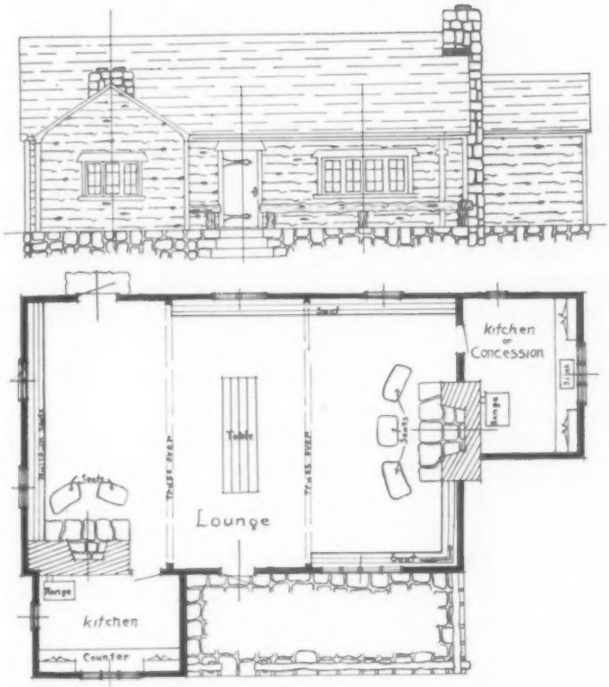


Fig. 4—Front elevation and floor plan of the ski shelter at Pittsfield State Forest

Cooking Facilities.—A suggestion for greater sociability is to have the cook-stove in the main room of the lodge, so that those called upon to do the cooking are not left out of the group conversation.

The Ski Shelter at the Pittsfield State Forest

One of the best examples of an existing ski shelter in western Massachusetts is the Pittsfield State Forest ski building. (See Figure 4.) It is also used for administration headquarters and as such has definite limitations as a ski lodge or shelter. It also serves year-round recreation. Its purpose in winter, besides those mentioned, is to provide comfort for the general public. It has no accommodations for over-night lodging, owing to the inexpensive rooms in the nearby towns. It is, in the true sense of the word, a shelter rather than a lodge.

Some people feel that this shelter has far too nice a floor. Recently, however, this has been temporarily covered with fiberboard, which protects it from heavy ski boots. The main room, 38 x 24 feet, is large enough to accommodate the general crowd desiring warmth, and is heated by two large fireplaces. Besides this main room, there is a combined kitchen and concession and an attendant's room. An adjacent building houses the latrine.

This Pittsfield plan makes up a picturesque and useful building. However, when it comes to accommodating the skier to the best advantage, it is lacking in several important details. These would not hinder its other uses. The first is a waxing and repair room. While not recommended by some in a building to be used for year-round recreation, this need should be given due consideration. Nor are there any provisions for drying clothing.

The Proposed Ski Shelter at the Beartown State Forest

A shelter is soon to be constructed under the direction of Forest Supervisor John H. Lambert at the Beartown State Forest in Great Barrington, Mass., for the sole purpose of accommodating skiers. It is to be the Swiss chalet type, constructed of natural stone, and is planned to take care of 200 skiers. (See Figure 5.)

This building is to be 65 x 45 feet, and will have a main room, a waxing and equipment concession room, a first aid and office room, and a room for food concession. The purpose of the Beartown shelter is to offer warmth, opportunity for waxing, repair, and the rental of the ski equipment facilities. It will be for day use only.

The shelter will have two fireplaces (with Heat-o-Meter heaters) in the main room, and stoves and running water in the smaller rooms. It is to be lighted by gas lanterns. The toilets are in separate buildings about 200 feet away. Although this proposed shelter

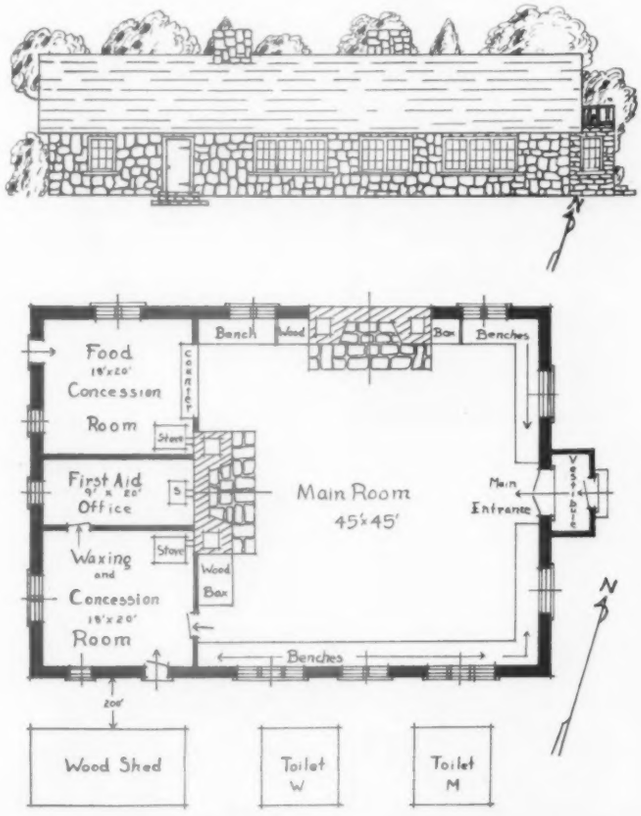


Fig. 5—Front elevation and floor plan of the proposed ski shelter of the Beartown State Forest

is to be used just for a skier's shelter (and perhaps an occasional banquet), experience has proved that there is a definite need to accommodate 1,000-odd skiers at a time who come by car or by snow train, direct from New York City to a railroad siding 500 feet distant.

The stone construction of the Beartown shelter is justified by the fact that plenty of stone is near at hand. The site is well up on the slope where it is handy for skiers. A proposed tow line will run 50 feet to the west of the structure. This tow will start at the railroad siding and run past the lodge to the top of all trails.

The heated waxing room is to be commended, as in fact is the general plan in its entirety. The location of this shelter right in the center of the skiing area is another asset, more important than the fact that supplies may have to be carried uphill.

There are no accommodations for drying clothing in the main room or waxing room. Also, there seems to be no suggestion for a ski rack. There is to be a peastone-packed floor, which is an excellent factor.

The nearness to centers of population makes it inadvisable and quite unnecessary to have over-night provisions. The construction as a one-purpose building has been questioned. The building as such seems to be quite justifiable, as proved by past experience on this particular area, and by the number it can accommodate.

A Well-Designed Ski Lodge

One of the best designs for a ski lodge with overnight provisions is that designed by Sidney N. Shurcliff. It contains many interesting ideas which are extremely practical and economical. (See Figure 6.) The purpose of this lodge is to provide the maximum comfort at a minimum expense for twelve to sixteen people. It features a large living room with an open fireplace and a stove, individual bunks with sliding doors —each bunk containing a window and a soft mattress on a resilient rope hammock.

The vestibule, waxing, and drying room are all in one. The toilets are separate and near stoves. The woodshed is handy to the large stove and fireplace. For economy there is no cellar, no furnace, no interior paint or plaster, and only one chimney, knotty-pine interior, and clapboards on the outside. There are no gutters, and the roof is made of fire-resisting asphalt shingles.

Almost all the windows have a southern exposure. The fireplace and cook stove are located in the main room close to the waxing room, so that no one is left out of the conversation. The living room runs the

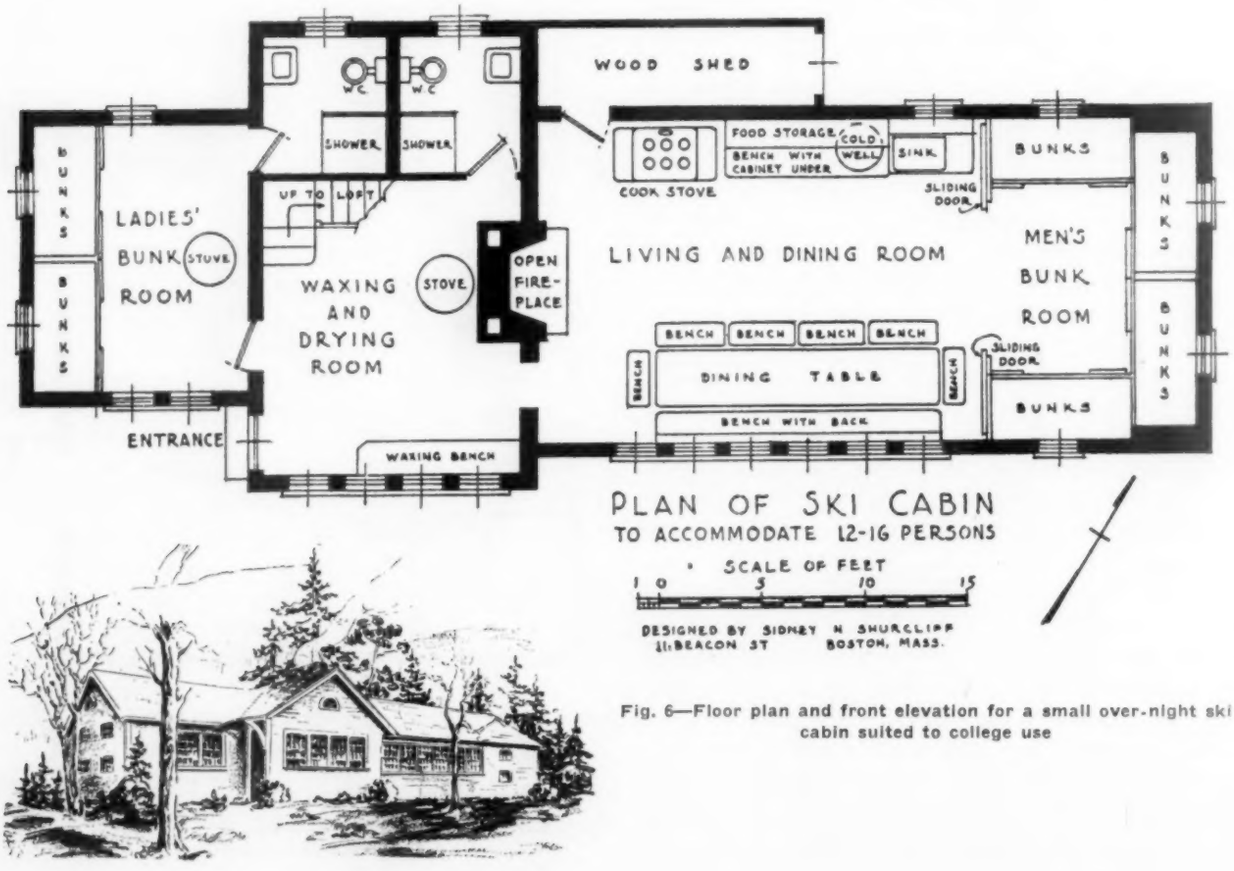


Fig. 6—Floor plan and front elevation for a small over-night ski cabin suited to college use

entire height of the building. There is a storage loft above the other rooms. Sheet-iron and wood-burning stoves are in the ladies' bunk room and the waxing-drying room. The cook-stove has an oven and a hot-water reservoir, and there is an 8-foot cold well for food storage under the preparation table.

For economy, the windows are in three stock sizes, and the entire structure is insulated with building paper. Many other little conveniences, such as folding chairs, add to the compactness and practicability of this ski lodge.

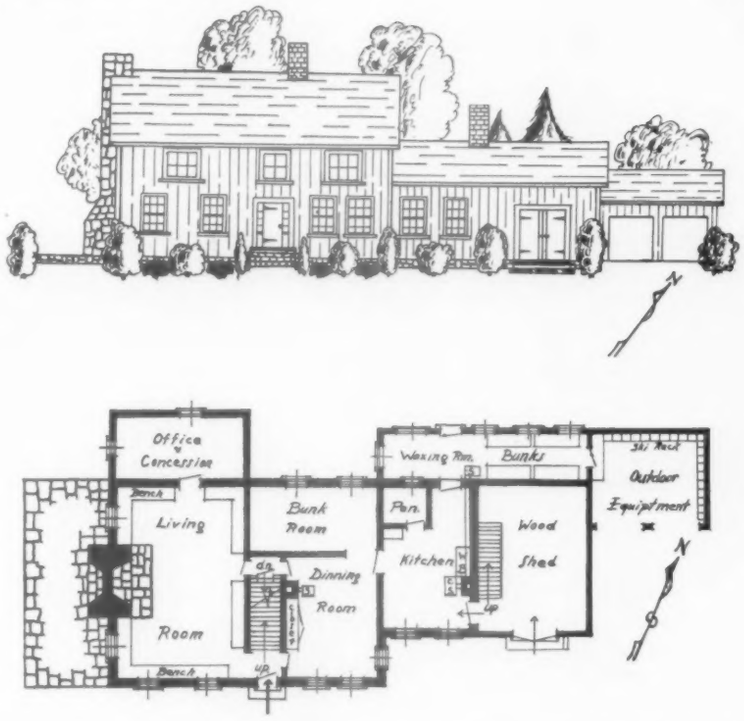


Fig. 7—Front elevation and floor plan of camp Najerog, Wilmington, Vt., showing how an old farmhouse may be made into a ski lodge

Transformation of a Farmhouse into a Ski Lodge

Northern New England has another type of ski lodge, the converted farmhouse. An example of this is a farmhouse in Wilmington, Vt., owned by Harold M. Gore, of Massachusetts State College. This building has the added utility of being a summer camp as well as a ski lodge in winter. (See Figure 7.) Outwardly it is just another typical New England farmhouse with its simple beauty. Inside it bespeaks utility as well as beauty. It has a combination office and concession, connecting with the main living room. In the living room a massive stone fireplace furnishes heat and cheer. The living room is walled with knotty white-pine paneling. Benches have been built in. The dining room and kitchen each have a wood stove, but a converted bunk room just off the dining room has none and needs none.

The waxing room has a stove in it and is between the kitchen and an open equipment shed where the ski rack is. A woodshed offers plenty of storage area.

The house has a south-southwest exposure with plenty of windows on that side. There is provision for drying clothing on two standing racks in the kitchen. These are more or less in the way of the cook. Owing to low ceilings there seems to be no place to put an overhead drying rack.

The front door could well use a vestibule, as it is the largest source of heat leakage. The floor is of wood and cannot stand the wear created by heavy ski boots. The Dutch system is used, whereby slippers are substituted for boots upon entering the house. This works out very well and gives the boots an opportunity to dry out between periods of usage. For the economy of heating, the second floor is closed up, but with the addition of a stove, one of the rooms upstairs could also be used as a drying room. For large parties, the upstairs rooms can be used as sleeping quarters.

For anyone in the snow belt who owns a farmhouse in the mountain districts, and as a matter of economy, this changing over of a farmhouse offers an inexpensive way to secure an extremely desirable ski lodge. Very little alteration is necessary, and the cost is surprisingly low.

BENJAMIN ELECTRIC MFG. CO.

General Offices and Factory: Des Plaines (Chicago Suburb), Ill.

230–234 W. 17th Street
NEW YORK

20 N. Wacker Drive
CHICAGO

448 Bryant Street
SAN FRANCISCO

LIGHTING EQUIPMENT FOR OUTDOOR SPORT AND RECREATIONAL AREAS

Football Field

Football Field

Baseball Field

"Play-Area" Senior

"Ellipto-Lite" Play-Area

"Alzo-Lite" Long Range

Tennis Court Reflector

Softball Field

Outdoor Swimming Pool

Tennis Court

There is a suitable lighting unit in the Benjamin line to meet any lighting problem in the recreational field. Write for complete data on "Sports" Lighting.

FOOTBALL FIELDS

Benjamin "Play-Area" Senior Floodlights meet every requirement of football field lighting. They combine in one unit a large open-type porcelain enameled steel reflector with an inner auxiliary reflector of etched Alzak aluminum. This famous "two-in-one" construction assures strong uniform illumination over the ground areas with adequate light on vertical surfaces such as players and other objects.

The "Play-Area" Senior reflector is 28½ inches wide and 17½ inches deep; finished green porcelain enamel outside, reflecting white inside. All metal fittings are electro-plated.

Units are designed for use with 750-1500 watt lamps and are supplied with any one of the following brackets: cross arm, for standard 4¼ inch wood cross arms; cross arm with pipe clamp, for clamping around 1 to 2 inch iron pipe; slip fitter, to slip over the top of a 1½ or 2 inch iron pipe. Units are also available with a "Saflox" lowering attachment.

Benjamin "Ellipto-Lite" Play-Area Floodlights are also used extensively in football field lighting. They are of the same general construction as the "Play-Area" Senior (with the same choice of brackets) but are smaller in size and somewhat lower in price. For football fields, the 750-1500 watt size unit, with a reflector 21⅞ inches wide and 14¼ inches deep, is recommended. For smaller sport and recreational areas a 300-500 watt size "Ellipto-Lite" is available.

In football fields where floodlights must be mounted 60 to 120 feet back from the sidelines behind the stands, the "Alzo-Lite" Long-Range Alzak Aluminum Floodlight is recommended. These units can be furnished with an etched Alzak aluminum deflector which redirects a portion of the waste light downward to provide illumination in the stands. Floodlights are supplied either with or without heat-resisting glass covers. They are 18¼ inches in diameter, take 750-1500 watt lamps, and are supplied with the same mounting brackets as "Play-Area" Units.

SOFTBALL, BASEBALL AND ATHLETIC FIELDS, PLAYGROUNDS, SWIMMING POOLS

In addition to their suitability for football field lighting, "Play-Area" Senior and "Ellipto-Lite" Floodlights have a wide application in lighting many types of outdoor sport areas such as baseball fields, softball fields, playgrounds, hockey rinks, swimming pools, stadia, etc.

TENNIS COURT LIGHTING

Benjamin "Tennis Court" reflectors are especially designed for the individual lighting requirements of tennis and provide exactly the distribution of light necessary for proper playing of this sport. Reflectors are etched Alzak aluminum and are available in either "Socket-Reflector" or patented Benjamin "Turnlox" types of construction. When used for certain locations on the court, reflectors are fitted with visors, as illustrated. Available for 750-1500 watt lamps only.

LIGHTING EQUIPMENT FOR GYMNASIUMS, LABORATORIES AND SHOPS

GYMNASIUMS, FIELD HOUSES, BASKETBALL COURTS

For effective glareless illumination of gymnasiums, field houses, basketball courts, indoor tracks and rinks, baseball cages, handball courts, etc., the Glassteel Diffuser is recommended. This unit provides the very finest quality of soft, well diffused illumination with a minimum of direct and reflected glare and consists of a porcelain enameled steel reflector in combination with an opal glass globe. The reflector has apertures in the top to allow approximately 11% of the light output to reach the ceiling to soften contrast, increase eye comfort and give the room a more cheerful appearance. Units are finished inside and outside in white porcelain enamel and are furnished with a choice of "socket reflector" separable fittings or "Turnlox" detachable hoods. "Turnlox" hoods allow the reflector, lamp and globe to be removed as a unit without disturbing the wiring. Units are supplied in sizes to accommodate lamps from 150 to 1000 watts.

When used in locations such as gymnasiums, field houses, handball courts, etc., a special heavy duty type of wire ceiling guard is used to protect the glass globe from damage in case of flying balls.

VOCATIONAL DEPARTMENTS

For the lighting of classrooms and buildings devoted to engineering and vocational pursuits such as wood and metal working, printing, automobile repairing and the like, a complete line of industrial lighting equipment is available. For general lighting in these locations the Glassteel Diffuser (described under gymnasiums above), the RLM Dome or the RLM "Silvered Bowl" Reflector Unit is recommended.

The RLM Dome Reflector is of porcelain enameled steel and provides good uniform illumination over flat and upright surfaces. It is finished white inside, green outside and is furnished in 60 to 1500 watt lamp sizes.

VOCATIONAL DEPARTMENTS (Continued)

The RLM "Silvered Bowl" Diffuser combines in one unit the ideal qualities of both porcelain enamel and Alzak aluminum reflecting surfaces to efficiently utilize the distinctive indirect properties of 300-500 watt silvered bowl incandescent lamps. The result is soft, well diffused illumination, characterized by a minimum of direct or reflected glare. The reflector is of porcelain enameled steel, white inside and outside, while the Alzak aluminum inner reflector is etched.

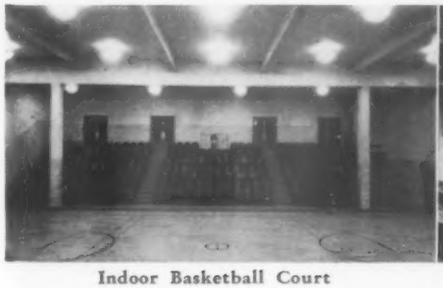
Either "Socket-Reflector" fittings or "Turnlox" hoods are available with RLM Dome Reflectors and RLM "Silvered Bowl" Diffusers.

LABORATORIES AND LOCKER ROOMS

The same lighting equipment recommended for vocational departments is suitable for laboratories where moisture, corrosive fumes and combustible vapors are absent. For laboratories where explosive vapors are present a complete line of Explosion Proof and Dust Tight equipment is available; where only moisture and non-combustible fumes are prevalent, "Vapolet" units, either with or without porcelain reflectors, meet requirements. These units are of sealed construction with heavy glass globes and aluminum guards. "Vapolets" are also ideal for use in damp locations such as basements, locker rooms, engine rooms, etc.

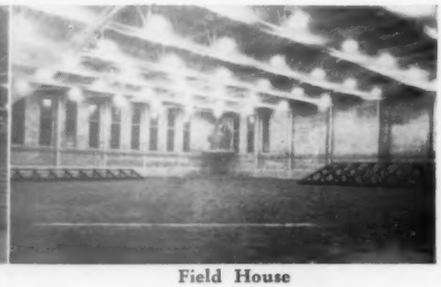
LIBRARY AND BOOK STACKS

For lighting book stacks in the library or shelves and bins in the store room, the "Stock-Bin-Lite" reflector is recommended. This unit provides a reflector of unique design in which uniformity of illumination from top to bottom of the shelf or book stack has been combined with careful shielding of the lamp to prevent glare when looking down the aisle. Reflectors are of porcelain enameled steel, white inside and outside, with a choice of four hood styles and come in 60, 75, 100 and 150 watt lamp sizes.



Indoor Basketball Court

Gymnasium



Field House

Glassteel Diffuser

RLM Silvered Bowl

RLM Dome Reflector

Vapolet with Dome Reflector

"Stock-Bin-Lite"

Laboratory

Library

Engineering Dept.

CROUSE-HINDS

ESTABLISHED 1897

Syracuse, N. Y., U. S. A.

CH 598

CROUSE-HINDS FLOODLIGHTS

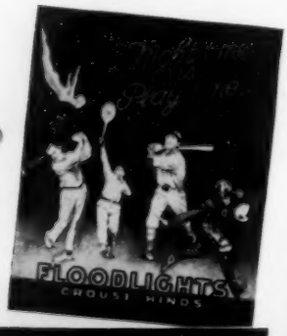
For Night Sports

Type ADE-16

Type MUA Alumalux

Bulletin 2299, entitled "Nighttime is Playtime," describes in detail the applications of Crouse-Hinds floodlights to outdoor sports lighting. A copy will be sent on request.

Type MUA Elliptalux



Night sports have been increasing in popularity year after year. Almost every sport shows greater attendance at night than during the day, and floodlighting provides increased hours for indulgence in amateur sport and recreation.

Modern illumination has made night football a most satisfactory game for both players and spectators. Lighted practice fields permit adequate hours of practice which do not interfere with class schedules.

Illuminating engineers have designed lighting systems for almost every kind of sport. Specific plans and descriptions of equipment will gladly be submitted upon receipt of detailed requests.

Type MUA is a universal, open type, 750 to 1500-watt floodlight which has a complete line of interchangeable and detachable reflectors.

Type ADE-16 is a universal 1000-watt unit of sturdy construction and high efficiency. The unit is dusttight and weatherproof, and is constructed entirely of corrosion-resisting metal.

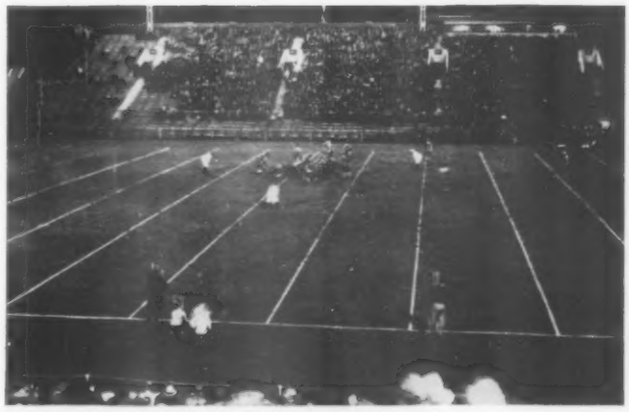
Any light distribution desired, from that of a spotlight to the widest spread floodlight, is available.

CROUSE-HINDS COMPANY
SYRACUSE, N. Y., U. S. A.

GENERAL ELECTRIC COMPANY

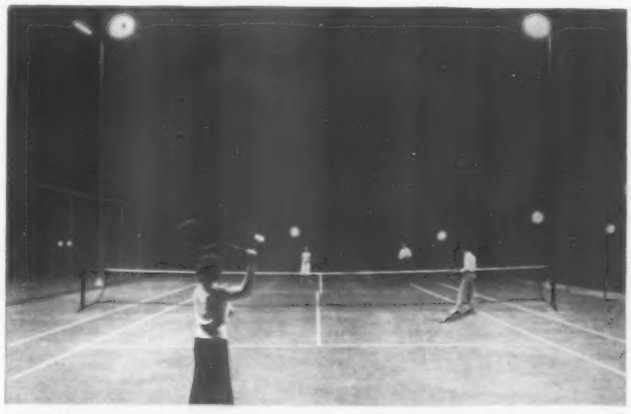
General Office: Schenectady, New York

SALES OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES



Floodlighting the Football Field provides for:

1. **Increased attendance and gate receipts from games**
2. **Additional practice time for the team**
3. **More opportunities for intramural activities**



Floodlighting increases the number of recreational facilities such as tennis, badminton, horseshoe courts; golf practice tees and putting greens; skating and hockey rinks

Artistic floodlighting of buildings and monuments is decorative and attractive

NOVALUX FLOODLIGHTING SERVICE

Comprises

1. Sizes and types of floodlights suitable for all common applications.
2. Scientific design of every floodlight for efficient performance.
3. Manufacture of every floodlight from best quality materials for long life and low maintenance cost.
4. Expert assistance with floodlighting problems.
5. Conveniently located sales offices, warehouses, and service shops.
6. Reasonable prices—no more than you pay for any other equipment of comparable quality.

Our designing and illuminating engineers have 25 years of experience in successful floodlighting of all kinds. We have a large staff of engineers and lighting specialists to help you obtain attractive, economical floodlighting.

For complete information, please refer to our nearest sales office or General Electric Company, Schenectady, N. Y.

ASK FOR CATALOG GEA-1865C

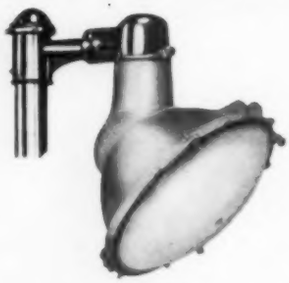
1500-watt sports floodlight Type L-48

300/1500-watt sports floodlight Type L-45

WESTINGHOUSE ELECTRIC & MFG. CO.

Edgewater Park **LIGHTING DIVISION** Cleveland, Ohio

Lighting for Sports, Laboratories and Shops



AVH-20
Aluminum unit with Hinged Door for Athletic Fields and General Outdoor illumination

A-8 and A-10
Small Lightweight Aluminum Units for Interior and Exterior Floodlighting

AFA-16 and AFA-20
Porcelain Enameled Open-type Units for Football, Baseball and other Athletic Field Lighting

WS-8
Aqualux Underwater Floodlight for Outdoor and Indoor Pools and Fountains

A-16 and A-20
Sturdy, Aluminum Enclosed Units for Building Floodlighting

CS-10
Aqualux Underwater Floodlight designed specifically for 500-watt Lamps

Stack Luminaire for Libraries and Storage Rooms

Silvered Bowl Diffuser
An Industrial-type Luminaire that provides well-diffused lighting for Shops and Laboratories

Locklite is a new principle in Industrial-type Reflectors for varying school applications

Athletic Fields — Westinghouse floodlights of several types are available to meet specific requirements of schools and universities. Westinghouse floodlights provide the finest, most efficient illumination for football, baseball and soft ball fields, tennis courts and general school sports field lighting. These units have a long life, are economical to install and operate.

Swimming Pools — Both for indoor and outdoor use, Westinghouse makes available a line of Aqualux floodlights to meet every swimming pool lighting requirement. Underwater floodlighting prolongs the use of pools beyond the hours of daylight and insures the safety of swimmers. Aqualux floodlights provide a high standard of efficient and trouble-free performance.

Laboratories and Shops — The Westinghouse line of industrial reflectors offers a wide range of selection for use in laboratories, shops, printing shops, gymnasiums, engineering buildings, etc. The new Locklite line of reflectors, the Silvered Bowl Diffuser and the Stack luminaire are ideally suited for school and university applications. These units offer effective light distribution at low maintenance and installation cost.

THE FAIR-PLAY COMPANY

Des Moines, Iowa

MITCHELL MFG. COMPANY, Milwaukee, Wisconsin, and Hanover, Pennsylvania

---

FAIR-PLAY
Automatic Electric Timers
and
SCOREBOARDS

Designed for those who have a fine sense of fair play and a deep aversion to the ill feeling and disputes often arising in timing close games. For those who have a good sense of showmanship which makes ordinary events dramatic and thrilling.

. . . . . .

Here is a fine Electric Scoreboard and timing device that is not a contraption but a real machine. Fair-Play units were designed by the best engineers available and are made in a modern manufacturing plant.

. . . . . .

All machine parts are carefully tooled and the design of working parts simple. There are no magnets, clumsy drums or discs in Fair-Play Scoreboards. They are noted for noiseless operation, quick action, easy installation and long life.

. . . . . .

The Scoreboard and Timing Clock are compact in size and light in weight. The case is constructed of steel, has baked enamel finish and polished metal trim. Not an unsightly eye-sore but an improvement to the appearance of any gymnasium.

. . . . . .

The Scoreboard is controlled by a compact control box placed on the officials' table. Easily operated and, because of reversible shaded pole induction motors, errors can be corrected instantly. The time clock is controlled by a separate control box also on the officials' table. No chance of game continuing overtime, as at end of each period vibrating horn blows automatically.

. . . . . .

Made in sizes and models priced so low that they can be purchased with only limited funds.

FAIR-PLAY Model
A patented automatic timer and electric Scoreboard

. . . . . .

Automatic timer—18 inch plate glass dial lighted from rear; loud 110 volt; horn may also be sounded at will.

Cabinet—37″ by 37″ x 9″ deep.

Scoring tapes—Driven by low geared reversible, induction motors. NO MAGNETS. Corrections instantly. Tapes lighted from behind.

Control boxes—Pressed steel with baked enamel finish; patented timeout clock in time control for timing timeout periods.

Quarter lights—Colored lights below horn grill indicate quarter being played.

. . . . . .

Write for complete specifications and details.

. . . . . .

Custom built boards—To meet specific requirements. Submit specifications.

. . . . . .

Other Standard Models—of timers and combined timers and scoreboards to meet the budget requirements of schools of all sizes.

FRED MEDART MANUFACTURING CO.

3568 Dekalb St. St. Louis, Mo.

Manufacturers of

Gymnasium Apparatus—Basketball Backstops—Telescopic Gym Seats—Playground Apparatus—Water Sports Equipment—Steel Lockers—Steel Wardrobes (The Lockerobe)—Steel Shelving

GYMNASIUM APPARATUS AND BASKETBALL BACKSTOPS

Medart Gymnasium Apparatus which is today acknowledged as the ultimate in gymnastic apparatus perfection, is the result of continuous, uninterrupted manufacture and constant improvement, since 1873. . . . Likewise the Medart line of Standard and Special Basketball Backstops has kept pace with the growing popularity of this sport. Interested parties are invited to avail themselves of the competent services of the Medart Installation Engineers.

Write for Gym Catalog G-3 and Backstop Catalog BB-2

TELESCOPIC GYM SEATS

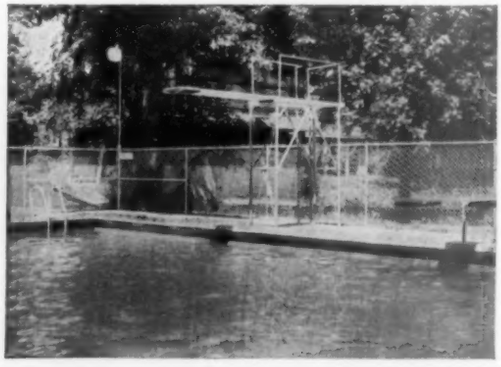
Conservation of valuable floor space in the gymnasium is realized with the installation of Medart Gym Seats which are built around a safety-plus application of the telescopic principle. . . . Medart Gym Seats glide in and out of the "nested" position with the greatest of ease—there is nothing to lift up or to pull down. . . . Nation-wide installations attest to the unanimous approval of discriminating buyers. . . .

Write for Gym Seat Catalog GS-1

PLAYGROUND APPARATUS

The importance of the Safety Factor in Playground Apparatus cannot be overestimated. . . . When the Medart Line was planned and developed, this all-important factor was forever foremost in the minds of Medart Engineers. . . . With safety assured, ruggedness and durability are a foregone conclusion. Let Medart Engineers help plan your playground.

Write for Playground Catalog P-4



WATER SPORTS EQUIPMENT

What the well equipped pool (indoor or outdoor) requires will be found in the Medart Water Sports Equipment Catalog. . . . Diving boards, towers, slides, ladders, etc., are fully illustrated and described. . . . A vast fund of practical installation knowledge is available to those faced with the responsibility of equipping a pool. . . . Consult with "Medart."

Write for Water Sports Catalog WS-1

PITTSBURGH - DES MOINES STEEL COMPANY

3425 Neville Island, Pittsburgh, Pa.
Room 994—270 Broadway, New York
1215 First National Bank Bldg., Chicago
924 Tuttle Street, Des Moines, Iowa
1224 Praetorian Bldg., Dallas, Texas
614 Rialto Bldg., San Francisco, Calif.

All Steel Grandstands

Patent No. 1,452,467

PITTSBURGH-DES MOINES STEEL GRANDSTANDS are used on all types of athletic fields and for indoor arenas. They are built in standard sections 18 feet long by 10 rows deep, each section seating 120 people. A stand may be any number of sections long by any number of sections deep. Its seating capacity may be increased from time to time, double decked if necessary, and no matter how often enlarged it will always present a neat and finished appearance. A roof may be provided over all or a portion of the stand.

Note the sturdy construction of the deck and supports—clearly illustrated in the two close-up views. Substantial handrails surround the stand, and may also be installed to divide it into sections.

The wood seat planks supported on cast iron or welded steel stools are securely bolted down to the deck. Other types of seats are furnished if desired. Aisles, at proper intervals, extend from front to back with walkways along the front or back if necessary. Entrance or exit is accomplished by means of stairs or ramps at the lower end of each aisle, or through wells in the stand.

The steel deck is built to shed water. Hence the space under the stands may be utilized for dressing rooms, toilet facilities, storage, etc. In a number of instances masonry walls have been built along the ends and back so as to totally enclose the space under the stands.

These stands are permanent. They do not weather, rot or decay and therefore will not weaken and collapse. Their first cost is low, and they have a high salvage value. Being assembled by means of bolts, they can be dismantled and re-erected at another location—a feature not possible with other types of construction.

Spencer, Iowa, Partially Covered Stand

Marietta College, Marietta, Ohio, Seating Capacity 4290
Masonry enclosure—ends and back

Southwest Stands—Penn State, State College, Pennsylvania, Seating Capacity 8160

An occasional coat of paint, the only maintenance necessary, keeps them looking new year after year.

Write our nearest office for "All Steel Grandstands" Bulletin No. 401, and any additional information you may desire.

All Steel Swimming Pools

Pittsburgh-Des Moines All Steel Swimming Pools represent the best value in durability, economy and appearance to be obtained. Lower in first cost than properly-constructed pools of other materials, the P·D M. All Steel Pool requires no maintenance other than a coat of paint at reasonable intervals. It is absolutely watertight; withstands frost action and ground movement without harm; is smooth, sanitary and good-looking for a lifetime. P·D M. designs, fabricates and erects steel swimming pools complete with all accessories—under a responsible guarantee of satisfaction. Send for our "All Steel Swimming Pools" Bulletin No. 402—and if you wish, a free consultation on your problem.

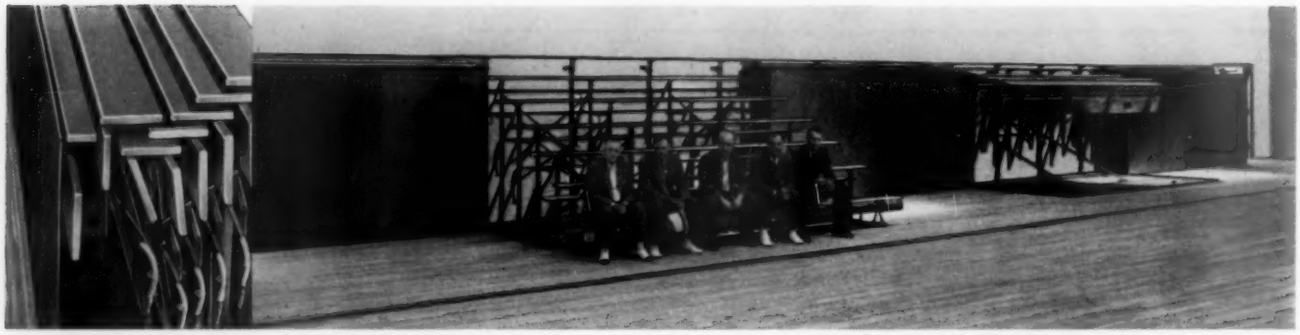
Summit Hotel, Uniontown, Pennsylvania
P·D M. All Steel Pool and Accessories

UNIVERSAL BLEACHER CO.

Manufacturers of Folding Gymnasium Stands; Portable Bleachers and Portable Wood and Steel Grandstands

606 So. Neil Street, Champaign, Ill.

FOLD-A-WAY GYMNASIUM STANDS



COMFORTABLE, ROOMY SEATING

Universal Fold-A-Way Stands are rigid and safe. The seat and foot boards are of such width and placement as to assure maximum spectator comfort.

MORE USABLE GYMNASIUM SPACE

When closed these stands fold compactly against the wall, concealed behind beautifully finished solid cabinets, making available for athletic uses many additional square feet of floor space.

EASY ACCESS FOR CLEANING

Because cabinet and stand sections operate independently, these stands may be folded and the cabinets left open, assuring ready access to both floor and wall areas.

GYM FLOOR PROTECTION

The closure panel lays out on the floor for the stand to rest upon, thus protecting the floor. There are no composition casters to wear out or to grind dirt into the floor. Self-contained locks operate automatically when the stand is opened or closed, eliminating holes in the gym floor and avoiding uncertain alignment with these holes as found in some of the roll or push type stands.

DIRECT SUPPORT AND X-BRACING OF SEATS

Each row of seats is supported every four feet on steel legs extending from seat to floor. Each vertical leg is diagonally X braced against thrust and side sway.

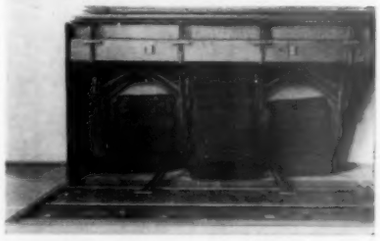
ROLL-A-WAY STANDS

We also make a roll type stand, similar in design to the Fold-A-Way except mounted on rollers which operate on tracks mounted on the cabinets.

STEEL PORTABLE BLEACHERS

You will find in the Universal Steel Portable Bleacher many new and exclusive features of design; many refinements which add to the comfort and convenience of your guests; and many improvements which make the erection, dismantling, and moving of these bleachers both simple and easy. Vertical steel posts under each row rest on angle iron sills bolted to 2 x 6" sub-sills, weather proofed against decay. Any number of rows can be added later to your initial installation, thus providing increased seating capacity as needed.

AUXILIARY CHAIR STORAGE



Where gymnasiums also serve as auditoriums, the auxiliary chairs may be stored beneath these stands; thus the chairs are instantly available for use and also partly distributed about the floor. Approximately 300 folding chairs can be stored beneath one eight-row section. Variations in stand height effect storage capacity.

TYPICAL INSTALLATIONS

Albuquerque, N. M., Senior High School. Bellingham, Wash., Bellingham High School. Canisteo, N. Y., Central School. Chicago, Ill., St. Sabina Community Center. Cincinnati, Ohio, Withrow High School. Darlington, Wis., Darlington High School. Haverstraw, N. Y., High School. Kane, Pa., Kane High School. Los Angeles, Calif., Leuzinger High School (Lawndale). Mahopac, N. Y., High School. Minonk, Ill., Community High School. Norristown, Pa., Senior High School. Pendleton, Ore., Pendleton High School. Ravenna, Ohio, Charlestown Township School. Springfield, N. J., Regional High School. Swampscott, Mass., High School. Warren, Pa., Beaty School.

For estimates on Steel Portable Bleachers, let us know the approximate seating capacity needed and preference, if any, to number of rows desired.

THE MATHIESON ALKALI WORKS (INC.)

60 East 42nd Street, New York, N. Y.

PLANTS
Niagara Falls, N. Y., Saltville, Va., and Lake Charles, La.

BRANCH OFFICES
Charlotte, N. C., First National Bank Building
Cincinnati, Ohio, Dixie Terminal Building
Philadelphia, Pa., Widener Building
Chicago, Ill., 410 North Michigan Avenue
Houston, Tex., Second National Bank Building
Providence, R. I., Hospital Trust Building
Washington, D. C., 1625 Eckington Place, N.E.

PRODUCTS

- **H T H (Concentrated hypochlorite)**
- **H T H-15 (Germicide)**
- **Lo-Bax**
- **Liquid Chlorine**
- **Anhydrous Ammonia**
- **Aqua Ammonia—26°**
- **PH-Plus (Fused alkali)**
- **MaFoS (Dishwashing cleanser)**

H T H

For a wide variety of sanitary purposes, particularly around the swimming pool, locker room and gymnasium, H T H is a most convenient and reliable source of available chlorine. Concentrated, H T H contains over 70% available chlorine. Moreover, it retains this high strength in warm weather and during long periods of storage.

H T H is a dry, free-flowing powder, readily soluble in water. It is shipped in cases of nine 5-lb. cans.

For Swimming Pools

At thousands of swimming pools throughout the country, H T H is used to chlorinate pool water, for general disinfection of surroundings and for prevention of Athlete's Foot. A sanitation routine which provides germicidal and fungicidal protection in and around the pool is easy and economical to follow with this concentrated hypochlorite. (Write us for complete directions.)

For pool water purification, H T H can be added direct to the pool in powder form, or fed in solution form with simple, inexpensive equipment. At many pools where liquid chlorine is used for regular chlorination, a supply of H T H is kept on hand for emergency use in case of a breakdown of pumps or chlorinating equipment, or an interruption in the power supply.

To Prevent Athlete's Foot

Locker rooms, shower rooms, toilets, pool runways, etc., are undoubtedly among the worst offenders in the spread of Athlete's Foot.

Health authorities agree that the best preventive is a careful sanitary routine which includes the use of hypochlorite solutions such as those made from H T H and Lo-Bax, both in footbaths and for general disinfection of surfaces which may transmit infection. Moreover, many States now require hypochlorite footbaths at public pools.

Sterilizing and Bleaching

School laundries, like commercial laundries, find that H T H solutions are uniform and economical for bleaching and sterilizing linens, towels, uniforms and other white goods, and as a sterilizing rinse for cotton bathing suits. H T H enables them to avoid the danger of over-bleaching, which shortens the life of fabrics, and the alternate danger of inadequate protection.

OTHER MATHIESON PRODUCTS

H T H-15—An all-purpose germicide and deodorant which is ideal for use in school kitchens, dormitories, camps, etc. H T H-15 contains 15% available chlorine and is simply added direct to water by the spoonful.

Lo-Bax—A convenient chlorine carrier packed in 1¾-lb. bottles and containing 50% available chlorine. For preparing footbath solutions and for use around shower and locker rooms where limited quantities of hypochlorite are required.

PH-Plus—A fused alkali manufactured especially for restoring to swimming pool water the natural alkalinity it loses in use and during filtration. Makes pool water "feel fine."

MaFoS—A new type of cleanser for dishwashing machines which comes in the form of dense, waterfree briquets. Tests prove it more efficient and economical than powdered cleansers.

Swimming Pool at Public School No. 12, Troy, N. Y., Where H T H Is Used to Protect Against Athlete's Foot

PENNSYLVANIA SALT MANUFACTURING CO.

ESTABLISHED 1850

Widener Bldg., Philadelphia, Pa.

New York Chicago St. Louis Pittsburgh Tacoma Wyandotte

Modern pools avoid guesswork and risks with

Perchloron

(Over 70% available chlorine in powder form)

FOR effective purifying and germicidal action, modern pools are making good use of Perchloron. They know it is easy to determine just the right amount to use to purify the water for a pool. For Perchloron is not only concentrated, but it keeps well and holds its strength—guarding against guesswork.

You get safety without the risk of waste. That saves money. But Perchloron saves further by doing multiple duty. You can use it to bleach and sterilize your towels, to deodorize and disinfect locker rooms and wash rooms, and to combat athlete's foot. No need to buy extra products for these purposes. That is why so many pools have turned to Perchloron.

THE AMERICAN SCHOOL AND UNIVERSITY

CHECK THESE ADVANTAGES

High available chlorine content (over 70%).
Comes to you in stable concentrated form.
Dissolves quickly in water.
Perfectly uniform.
Packed 12 handy-sized cans to the case—no return containers to bother you.
Cans have the push and pry-up top—new, easier to open.
Highly economical because it keeps so well and so little goes so far.

FREE · NEW BOOKLET

A handy, 36-page booklet on swimming pool sanitation. Covers the many uses of Perchloron. Write for your free copy today.

WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus

Main Office and Factory: Newark, New Jersey

"SWIM IN DRINKING WATER"

Boston, Bridgeport, Buffalo, Charlotte, Chattanooga, Chicago, Cleveland, Columbus, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Knoxville, Lexington, Los Angeles, Madison, Minneapolis, Oklahoma City, Philadelphia, Pittsburgh, Roanoke, San Francisco, Seattle, St. Louis, Syracuse, Washington, D. C.

Wallace & Tiernan, Ltd., Toronto, Canada
Wallace & Tiernan, Ltd., Winnipeg, Canada
Wallace & Tiernan, Ltd., Montreal, Canada
Wallace & Tiernan, Ltd., London, England

"Swim in Drinking Water"

With the school swimming pool firmly established as a part of the physical training program, efficient sterilization is necessarily important. School executives can do no better than to follow advice given in the Report of the Joint Committee of the American Public Health Association and the Conference of State Sanitary Engineers. This report, in part, states: "From all available information, the addition of chlorine either as a gas or water solution by use of proper apparatus is today the most satisfactory method of pool disinfection." Chlorine alone gives the residual penetrating action for the complete protection of bathers at every point in the pool. More than 4000 swimming pools in the United States today rely on W&T chlorinators for positive disinfection.

W&T Type MSE Chlorinator—For the majority of indoor pools and smaller outdoor pools, where chlorine requirements are less than twelve pounds per day, this type apparatus is most suitable. With a feed range sufficiently wide to include all changes in bathing load or recirculation rate, it is accurate and dependable in operation and may be safely entrusted to non-technical help.

W&T Type MSE Chlorinator for the Sterilization of Average Sized Swimming Pools

W&T Type MSV Chlorinator is the efficient sterilizer for large pools, having heavy bathing loads. Simplified design and sturdy construction have combined to make unusual performance records for this type of chlorinator. Of more than 5000 installed since the first went into service fifteen years ago, not a single machine has ever worn out. A survey of repair costs indicates average annual maintenance charges do not exceed one per cent of the initial investment.

W&T Ammoniator — Used with a W&T Chlorinator for the additional advantages of chlorine-ammonia treatment. Particularly in large outdoor pools where heavy bathing loads occur, chlorine-ammonia treatment improves operation by maintaining effective sterilizing action throughout the pool without complaints of tastes or odors. Additional advantages are found in improved algæ control in filters and on pool walls. W&T Ammoniators embody the same rigid production standards and excellence of material as W&T Chlorinators, differing only in the special materials required for handling ammonia.

W&T Ammoniator Used with a W&T Chlorinator to Produce Chloramine

W&T Chlorine Comparator—Swimming pool chlorination can only be controlled accurately, economically and safely when regular use of the orthotolidin test is made. The W&T Hellige Chlorine Comparator meets all requirements for a rugged, portable, accurate testing outfit. Its operation is so simple that accurate determinations of residual chlorine require only a moment's time and no specialized knowledge.

At Your Service—A W&T nationwide staff of skilled water purification experts are prepared to offer recommendations on any problems of swimming pool sterilization. The continued satisfactory operation of W&T equipment is their direct responsibility.

Current literature on swimming pool sanitation and W&T equipment is available on request.

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET, NEW YORK, N. Y.

BRANCH SALES OFFICES

Boston . Charlotte . Chicago . Cincinnati . Cleveland . Detroit
Indianapolis . New Orleans . New York . Philadelphia . Pittsburgh . St. Louis . Syracuse

Letters THAT SPEAK FOR THEMSELVES . . .

Regarding

ATHLETIC FIELDS
TENNIS COURTS
PLAY GROUNDS
BASEBALL DIAMONDS
TRACKS
HANDBALL COURTS
PARADE GROUNDS
PARKING FIELDS
DRIVES
WALKS
ROADWAYS

GEORGIA TECH ATHLETIC ASSOCIATION
ATLANTA, GEORGIA

May 26, 1938

Mr. Earl Arthurs
Solvay Sales Corporation
212 South Tryon Street
Charlotte
North Carolina

Dear Sir:

This is to certify that we have been using Solvay Calcium Chloride on our tennis courts, running track and baseball diamond for the past few years and have found that it gives very satisfactory results.

It is impossible to keep clay tennis courts in condition through dry summer weather unless they are given one or two applications of calcium chloride annually. On the track, we have found that calcium chloride around the spots where the runners dig their starting holes and on the pole where most of the runners run, has been of great aid in keeping the track in proper condition. The take-off in the high jump, broad jump and pole vault is also made better by using calcium chloride. In baseball, we use calcium chloride to keep the grass off the skinned part of the infield and find that it gives a smoother and better surface for fielding the ball. It is also invaluable on the pitcher's mound and on the batter's box.

We feel that the investment annually in several tons of chloride is worth double the money that we spend on this product.

With kindest regards and best wishes, I am

Sincerely,
W. A. Alexander
W. A. Alexander
Director of Athletics

And other users say virtually the same. A letter from the principal of Canoga Elementary School which appeared in the "Los Angeles School Journal" states in part:

". . . Last year at least two hours a day were spent by one of the custodians sprinkling the grounds which were just as dusty as ever within one-half hour. When the cost of the custodian's time plus this enormous water bill is computed for the year this [the use of Calcium Chloride] is indeed an economy . . .

". . . From the first a decrease in the number of absences due to hay fever, asthma, colds, and other respiratory ills were noticeable. Because of the dustless condition, the pupils can now play and enjoy their games. Handball courts which were unused, are popular and are always filled. They may even jump rope without one cough. Even on our football field, when the surface is scuffed up, no dust arises as each particle is weighed down by its coating of calcium chloride. This enjoyment of play not only lessens the troubles of the playground teacher, but promotes the health of the players. For these reasons the calcium chloride treatment is the first item on our budget requests and we are hoping to have no break in this valuable service."

SOLVAY CALCIUM CHLORIDE

As we have said, these letters speak for themselves. But so that you may have the complete story on Solvay Calcium Chloride—its low cost, ease of application, and clean, odorless benefits, write for 28-page booklet "The Clean, Easy, Inexpensive Way to End Dust." Write to Solvay Sales Corporation, Dept. 49, 40 Rector St., New York, N. Y.

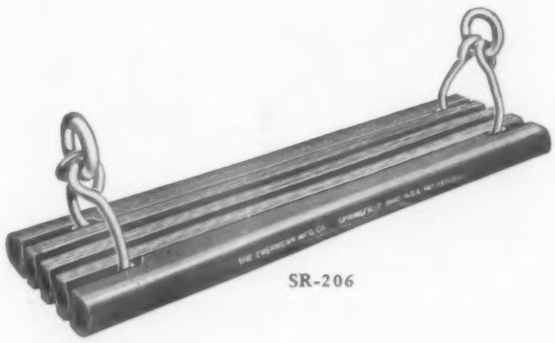
THE EVERWEAR MANUFACTURING COMPANY

35-65 S. Sycamore Street

Springfield, Ohio

EverWear

Playground Apparatus, Beach and Swimming Pool Equipment, Basket Ball Backstops and Gym Mats



SR-206

SR-216

EVERWEAR CUSHIONED RUBBER SAFETY SWING SEATS

Covered by U.S. and Foreign Patents

These safe swing seats give an element of safety to the swing which it has never had; changing an outfit classed as very dangerous, into one which can take its fine place on the playground without fear of results. "Reduced our accidents 70 per cent." INVESTIGATE THEM.

PLAYGROUND APPARATUS—Swings, Slides, See-Saws, Merry-Go-Rounds, Giant Strides, Merry-Wave-Strides, Combination Outfits, Flagstaffs, etc. Write for Catalogue No. 30.

BEACH AND SWIMMING POOL EQUIPMENT—Diving Boards and Outfits, Fixed and Removable Pool Ladders, Life Guard Chairs, Diving Towers, Rubber Foot Trays and Germicide for the prevention of "Athlete's Foot," Water Slides, etc. Write for Catalogue No. 28W.

BASKET BALL BACKSTOPS AND GYM MATS—Forward and Backward Fold Backstops, Swing-Up Outfits of all kinds, Coliseum or Field House Backstop, Fixed Extended Wall Types, etc. Write for Catalogue No. 31B.

Everwear Stands Wear and Tear

AMERICAN PLAYGROUND DEVICE CO.

Anderson, Indiana, U. S. A.

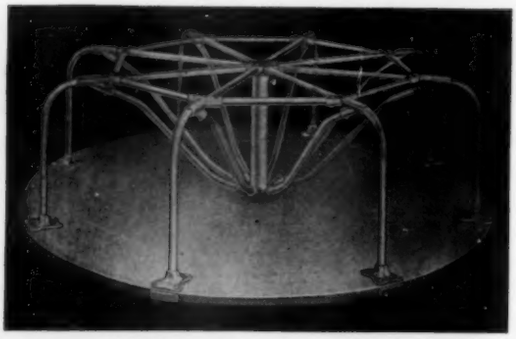
Manufacturers of Playground Equipment—Swimming Pool Equipment—Diving Boards
Gym Mats — Foot Baths and Hypochlorite for Athlete's Foot
Chain Link Tennis Nets

PRODUCTS

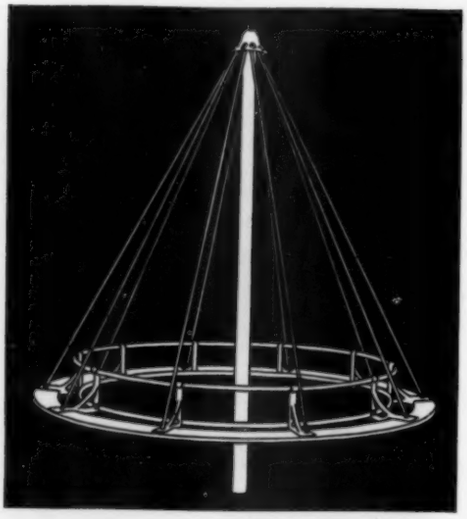
American Playground Equipment is Approved and Specified by leading School Authorities—the American line includes everything for playgrounds—Swings, Slides, See-Saws, Castle Towers, Wave Strides, Ocean Waves, Combination Units, Merry-Go-Rounds, Giant Strides and a hundred other proven items.

AMERICAN COMBINATION UNITS

M-4 MERRY-GO-ROUND



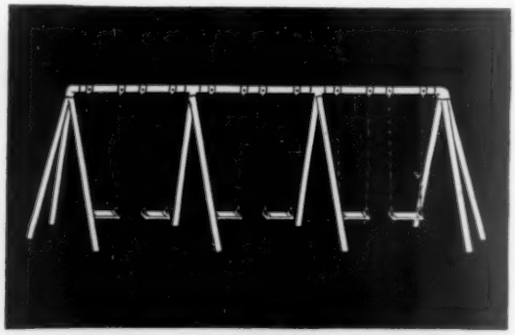
OCEAN WAVE



CATALOGUES AND LITERATURE

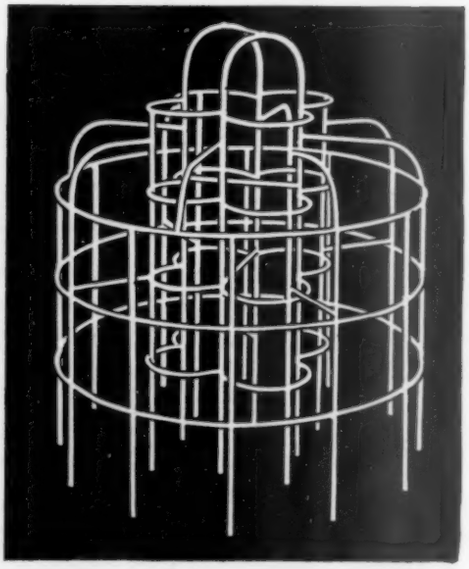
Complete literature and prices gladly sent on request. Each product is backed by our nation-wide reputation for Integrity and Dependability—We make prompt shipments, no waits or long delays.

AMERICAN SWING SETS



AMERICAN ALL-METAL SLIDES

CASTLE TOWER



AMERICAN EQUIPMENT IS APPROVED AND SPECIFIED BY SCHOOL AUTHORITIES FROM COAST TO COAST

Each American product is guaranteed and backed by our 25-year reputation of Integrity and Responsibility. Our complete line is thoroughly tested and proven. Send today for our complete literature and prices on items shown on this page or opposite page —please mention item in which you are especially interested.

★ ★ ★ ★ ★

AMERICAN PLAYGROUND DEVICE CO.

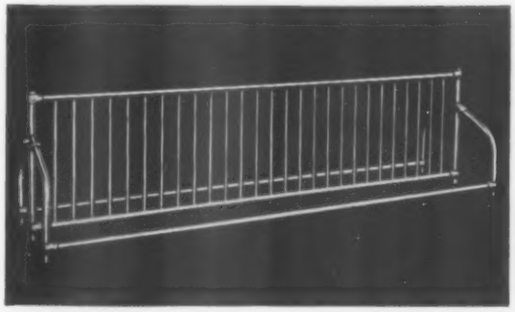
Anderson, Indiana, U. S. A.

Foremost Manufacturers of Foot Baths for Athlete's Foot — Chain Link Tennis Nets Gym Mats — Floodlights — Diving Boards — Bicycle Racks — Playground and Pool Equipment

PRODUCTS

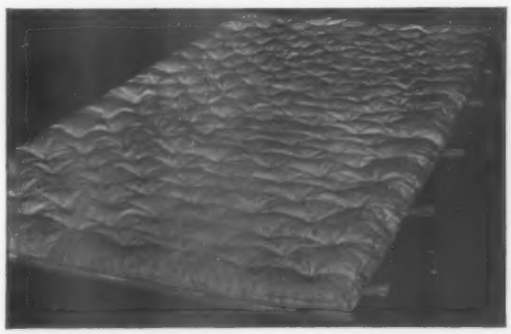
American School Equipment includes Gym Mats—Foot Baths — Diving Boards — Pool Equipment — Chain Link Tennis Nets — Ornamental Playground Fence—Playground Equipment and Bicycle Racks. Send for information and prices — please mention name of item in which you are interested.

AMERICAN BICYCLE RACKS



American Bicycle Racks are the permanent solution to that "Bicycle Parking" problem—used nationally.

AMERICAN GYM MATS



American Gym Mats are springy and resilient—offer greatest economy and durability.

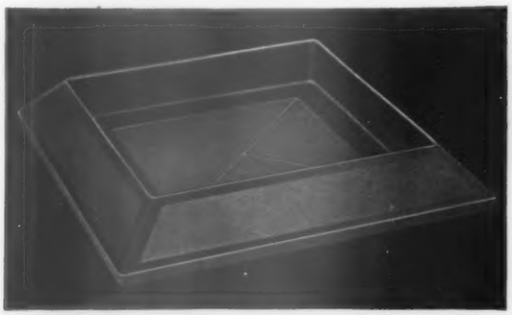
CHAIN LINK TENNIS NETS

American Chain Link Tennis Nets lead in durability and performance—Used by nation's largest Schools and Colleges.

GUARANTEE AND SERVICE

American products are Approved and Specified by leading School Authorities from Coast to Coast. Each item fully guaranteed—all shipments made promptly, no waits or delays.

FOOT BATHS FOR ATHLETE'S FOOT

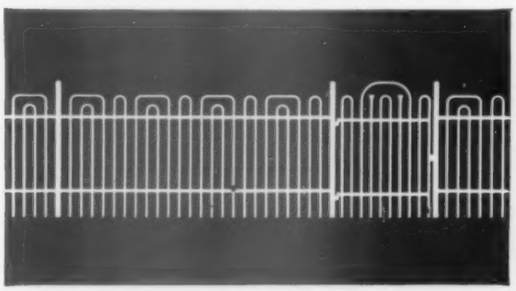


American Foot Baths and Hypochlorite are guaranteed to kill Athlete's Foot Fungi in less than 30 seconds.

SWIMMING POOL EQUIPMENT

American Pool Equipment is foremost in construction and performance—Use American Official Regulation Diving Boards for dependability.

AMERICAN ORNAMENTAL FENCE



American Ornamental Fence is practical and durable—essential for the protection and beautification of school property.

MITCHELL MANUFACTURING CO.

"Betterbilt"

Playground Apparatus and Beach and Pool Equipment

Milwaukee, Wisconsin

FOLD-O-LEG TABLES

For cafeterias, libraries, sewing rooms, study tables, kindergartens, commercial departments, social rooms. Reduce your investment in furniture by using Mitchell FOLD-O-LEG Tables. They will satisfactorily replace the most expensive tables. Unusually strong — surprisingly rigid—Save 300% storage space. Design and construction of steel tubular leg units provide 25% greater seating capacity.

Made in convenient sizes. Table tops with fir veneer, Tempered Masonite Presdwood or Linoleum.

Easily folded and handled

Below is a partial list of schools now using Mitchell FOLD-O-LEGS:

San Bernardino High School, San Bernardino, California.
Union High School, Fallbrook, California.
Western State College, Gunnison, Colorado.
Twin Falls District No. 1, Twin Falls, Idaho.
High School, Bloomington, Illinois.
High School, Rock Island, Illinois.
Thornton High School, Harvey, Illinois.
Purdue University, LaFayette, Indiana.
Hoover School, Flint, Michigan.
University of Michigan, Ann Arbor, Michigan.
Stillwater City Schools, Stillwater, Minnesota.
Hamilton School, St. Louis, Missouri.
School District No. 25, Broken Bow, Nebraska.
High School, Laconia, New Hampshire.
High School, Albuquerque, New Mexico.
Board of Education, Newburgh, New York.
High School, Hudson, New York.
State School of Science, Wahpeton, North Dakota.
Findlay College, Findlay, Ohio.
Paulding Village School, Paulding, Ohio.
High School, East Berlin, Pennsylvania.
High School, Lewistown, Pennsylvania.
South Dakota State College, Brookings, South Dakota.
Bryan High School, Bryan, Texas.
Brigham Young University, Provo, Utah.
City Schools, Norfolk, Virginia.
Cowlitz School District, Castle Rock, Washington.
Vocational School, Milwaukee, Wisconsin.

BOOKLETS

(Illustrated)

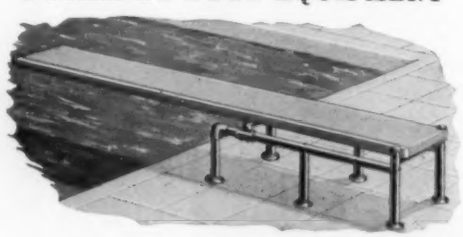
1. **Healthy and Happy Children**
2. **Mitchell Swimming Pool Equipment**
3. **Mitchell Fold-O-Leg Tables**
4. **Complete Playground Apparatus Catalog**

PLAYGROUND APPARATUS

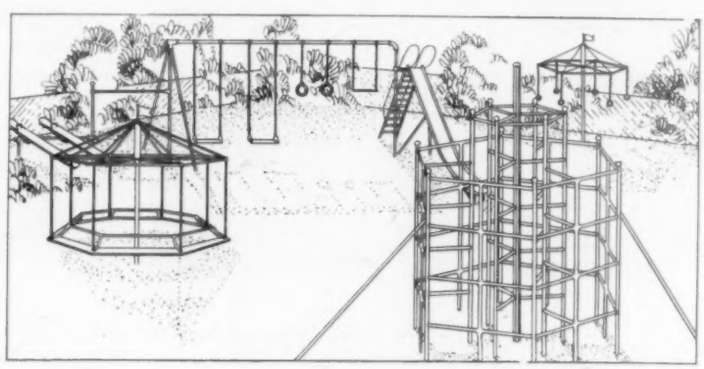
Safety is the important feature of all Mitchell Playground Apparatus. Every device reflects the years of study devoted to the physical welfare and wholesome amusement for children. Special attention is always given to provide the ideal combination of individual and group play.

Playground Investment should be considered as carefully as any other item. Mitchell offers for the first time a "yardstick" upon which to base your equipment appropriation. Compare your investment per child with that recommended by leading playground and recreational experts. Send for Booklet No. 1 today.

SWIMMING POOL EQUIPMENT



The above 1 Metre Diving Stand is only one of many pool devices; Diving Boards, Stands, Towers, Ladders and Pool Slides. Write for complete Booklet No. 4.



RECREATION EQUIPMENT CO.

Manufacturers of Play Equipment for Playgrounds, Parks, Pools and Beaches

724-26 West Eighth Street, Anderson, Indiana

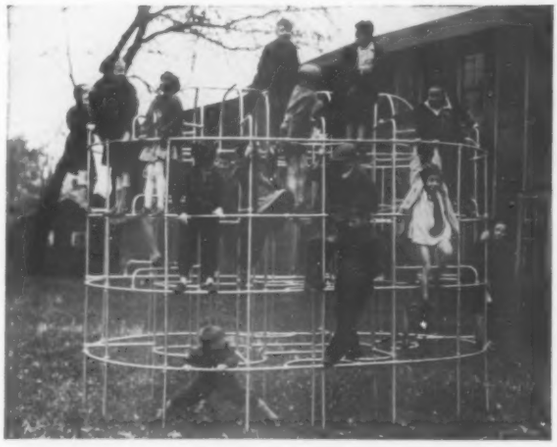
FOR THE PLAYGROUND

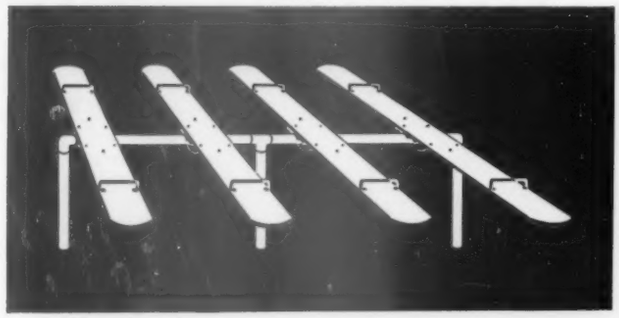
Swings, Slides, Merry-go-round, "Monkey Jungle", Gym Combinations, See-Saw Sets, Ocean Wave, etc.

THE RECREATION LINE

FOR THE BEACH AND POOL

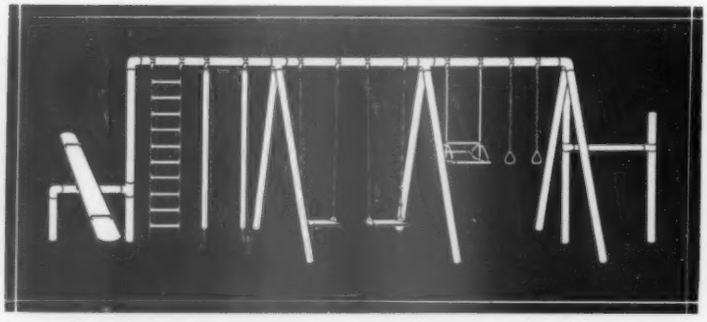
Diving Board Outfits, Pool Ladders, Slides, Life Guard Chairs, Pool Cleaning Equipment, Diving Mask Outfits, etc.



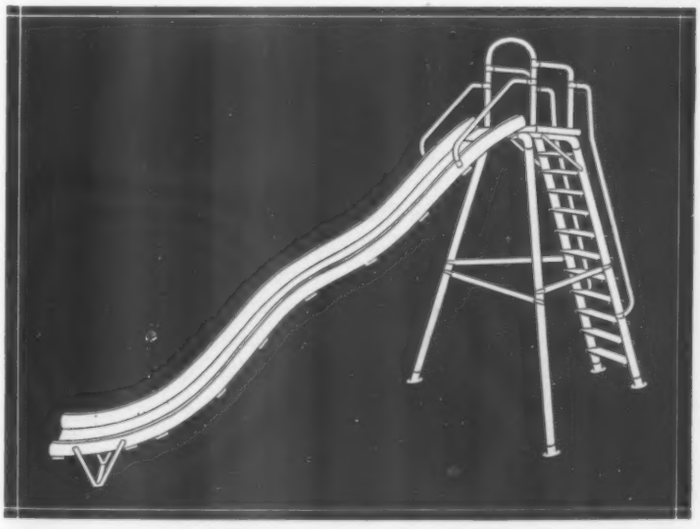


Many different See-saw or Teeter-totter Outfits. We use only the very best vertical grain Douglas Fir for the boards

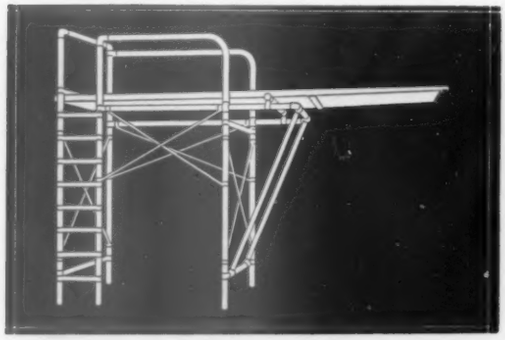
The Monkey Jungle is positively the latest and most scientifically designed Climbing Device ever produced. We invite comparison



Gym Combinations of all styles and sizes with all metal parts made of hot-galvanized steel and malleable iron



Slides of all styles and sizes



A great variety of Diving Board Outfits. "RECREATION" Boards are used by the Champions

BE SURE TO WRITE FOR NEW 1939 CATALOG. FREE FOR THE ASKING

THE AMERICAN SCHOOL AND UNIVERSITY

SECTION VII
CLASSROOM—LIBRARY—AUDITORIUM

BETTER PLANNING FOR COLLEGE CLASSROOMS

By W. K. HARRISON

Harrison & Fouilhoux, Architects

THE architect who creates a design for a comfortable home is one who understands the principles of cultivated living. The ability to create comes in large measure from personal experience followed by a sympathetic analysis of the fundamental needs of the home environment. Architectural progress results from such creative planning.

To a large extent the design of educational institutions has lacked this kind of planning. There has been a rather blind following of a traditional pattern—a pattern which was created to meet the needs of academic programs of past decades. It is true that new exterior designs, new materials and services have been incorporated in recent buildings. These changes in architectural treatment and mechanical services represent adaptability and not fundamental creation in terms of purpose and function of modern education. Progress will result not alone from the architect's ability to answer questions pertaining to safety, maintenance, sanitation, desirability, and flexibility, but also from his ability to interpret the philosophy of education and to experience the procedures of its dynamic program.

The Importance of Functional Design

The impressionistic type of college building copied after classical architectural styles may have been fitting for an educational program which stressed Latin, Greek, and the memorization of historical facts. However, the mere attainment of a knowledge of unrelated facts and the ability to recite from memory do not constitute a college education today. The fundamental objectives emphasize traits and outlooks and the development of appreciation of life activities in a democratic social group. The new college is teeming with activity related to the world around it as compared with the cloister atmosphere of previous decades. Such a program requires a new environment, and more importance must be placed on functional design. The impressionistic type of building is obstructing educational progress.

These changes are slow to come about. Only too frequently the educator who is progressive in curriculum methods handicaps his program by restricting building design to the traditional pattern. The architect may lack complete understanding of modern education, and therefore plans in terms of his college experience or some traditional style. The tendency is to defend existing buildings long after effective functioning has become impossible. Improvement in college planning is based largely on the willingness of educators and architects to slough-off the standardized patterns.

The typical college classroom is an excellent example of a continuing traditional design. Originally, the size of the room was determined by limitations imposed so that each student could recite regularly. Later, economic problems made larger classes a necessity. In some cases the popularity of exceptional teachers led to the development of large lecture rooms. Recent demands for more space caused by increased college population have been met by adding more classrooms, until today we have many factory-like buildings with similar rooms lining both sides of a central corridor. These buildings are perfect expressions of the mass-production of "educated" persons. But the emphasis in modern educational programs is placed on the individual as opposed to the class group. The difference is the same as that between building and manufacturing. It is no longer practical to plan an educational plant to a standard pattern. Each space requires individual attention to function properly and to contribute its share to the training process.

Rooms Planned to Meet Specific Purposes

Emphasis on the individual, the establishment of the tutorial systems, guidance programs, and small group conferences, suggest building requirements

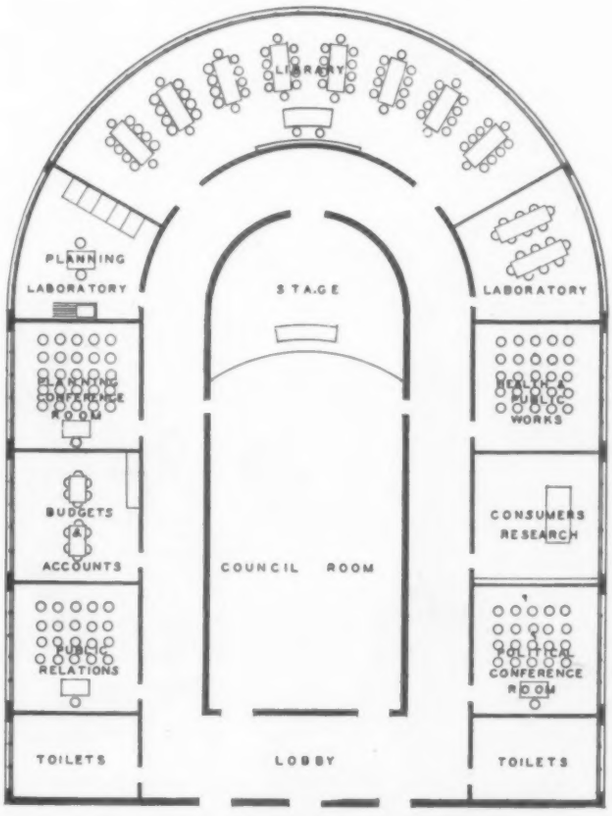
which cannot be expressed in terms of classrooms. The individual work is supplemented by seminars, group discussions, and projects requiring special facilities. Frequently the foundation or survey courses are carried on in large lecture rooms. One must look far, however, to find need for the old-fashioned recitation room. The new college requires rooms of individual character to meet each of the many different requirements. Therefore, the suggestions which follow do not apply to designs for typical classrooms. On the contrary, they represent a limited number of types of rooms designed to meet specific purposes.

A STUDENT FORUM UNIT *

The aims of the Student Forum Unit are: first, to help students experience life situations by participating in the formation and adoption of policies in the administration of the school and in municipal and state offices; second, to meet the interests of those who are to participate in the activities of our society.

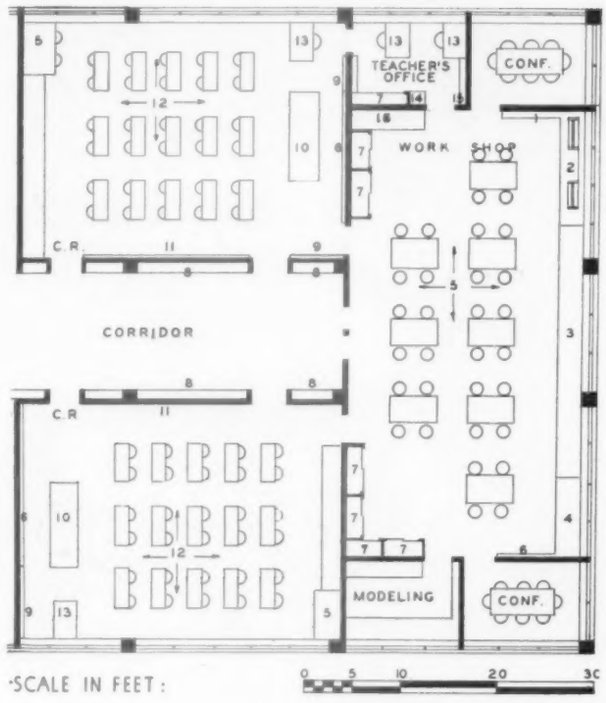
Plan No. 1 suggests one possible arrangement for such a unit. Provision is made for student council meetings, study of politics, laws, finance, and city planning, experimentation and research, and public meetings. Each room is designed to meet a specific need. The use of movable partitions between laboratories assures a large degree of flexibility.

* Conceived by Oran I. Brown, K. M. Retallick, and Ray R. Shew.



Plan 1—Student Forum Unit

Plan 2—Mathematics Suite



LEGEND

1. Tool rack
2. Lathes
3. Work-bench
4. Solder and glue bench
5. Work tables
6. Blackboard
7. Storage cabinet
8. Showcases
9. Bulletin board
10. Demonstration table
11. Display
12. Student tables
13. Teacher's desk
14. Files
15. Bookcase
16. Mimeograph

THE MATHEMATICS SUITE †

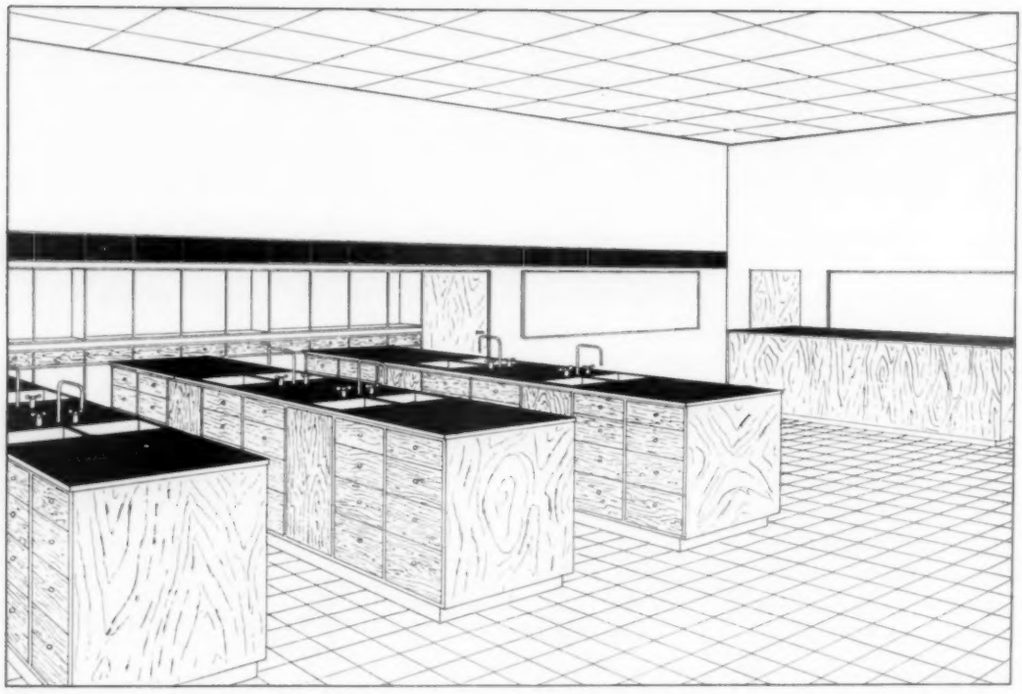
The teaching of mathematics in its proper setting and relating it to life activities requires that it be treated as a laboratory science. Plan No. 2 illustrates a laboratory unit designed to create interest and show relationships of mathematics to various projects.

Pictures, models, books and magazines are provided. Machines eliminate routine calculations. Tools, work tables, and modeling room provide means for securing a physical picture of mathematical methods. There is provision for conferences in small groups and between teachers and students.

A SCIENCE LABORATORY

Simplicity in design, compactness, and adequate storage facilities are desirable characteristics of a science laboratory. Plan No. 3 illustrates these qualities. Only one corner of the room is shown, with a demonstration table in the background adjacent to a preparation room and instructor's laboratory. Along

† The unit was designed after suggestions of G. E. Hartrick, H. P. Kelsey, and L. R. Armstrong, school superintendents.

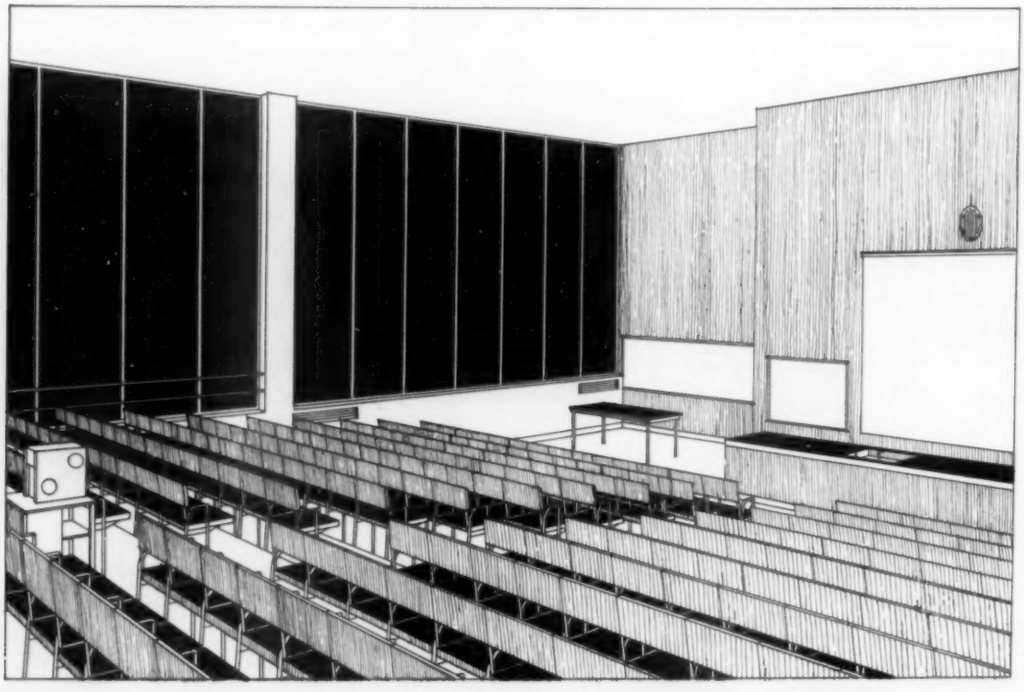


Plan 3—
A Science
Laboratory

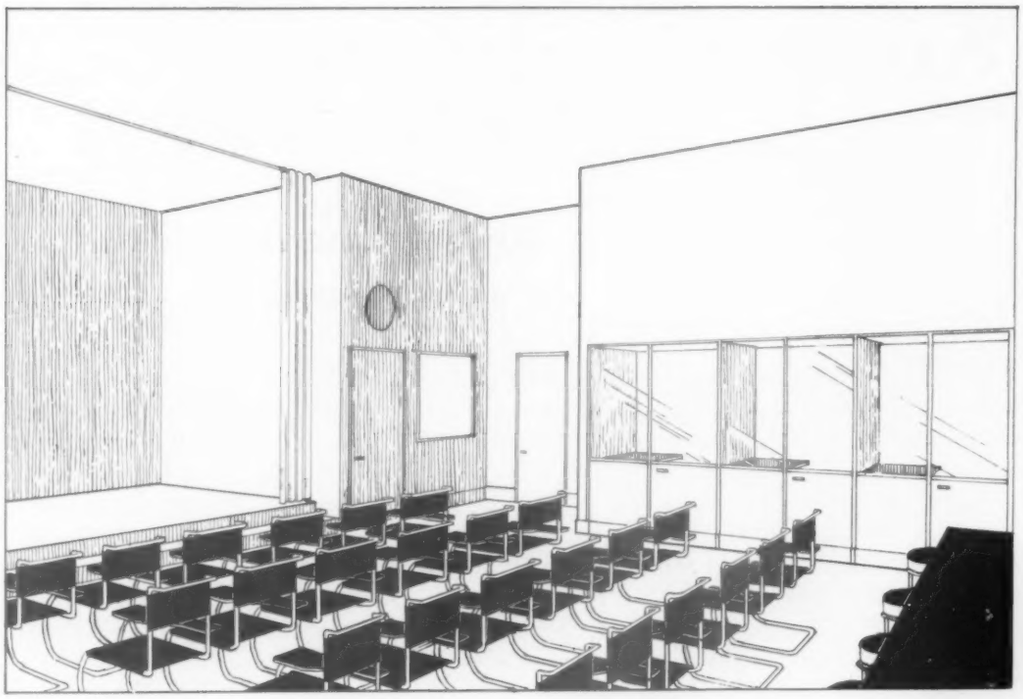
the walls are student cubicals readily adjustable to several sizes.

A LECTURE ROOM

Plan No. 4 shows a lecture room for 300 students, so designed as to be of use in any of the various foundation courses. Fixed seats provide maximum seating per square foot and assure quiet. The windows are equipped with automatic shades controlled from the lecturer's table, thereby saving time when motion pictures or slides are shown. A 16-mm projector and stereopticon are indicated. The roll screen behind the lecturer's table conceals a blackboard. Smaller blackboards are provided for posting assignments, bibliographies, and problems. Connection with radio and a public address system makes possible the use of this room for listening to speeches from all parts of the world.



Plan 4—
A Lecture
Room



Plan 5—
A Project
and Seminar
Room

A PROJECT AND SEMINAR ROOM

Plan No. 5 illustrates the type of provision needed for project and seminar groups. The main room is equipped for 24 students with light-weight movable chairs and work tables which may be arranged to meet any need. In the rear is a small conference room suitable for groups of as many as 10 students. A storage room for project materials and tools is provided. A high degree of flexibility is essential for this type of room.

A LANGUAGE ROOM

Language is the expression of the people. Plan No. 6 indicates the type of room which permits such expression in its proper setting. A stage is provided in the front of the room. At one side is a series of booths in which students may listen to phonograph records. A work table in the rear is provided. The instructor's office and conference room is located behind the stage. A storage space and short-wave radio are provided at the right of the stage.

Plan 6—
A Language
Room

CLASSROOM AND EQUIPMENT REQUIREMENTS FOR THE NEW SOCIAL STUDIES

By J. W. BALDWIN

The University of Texas

RECENT curriculum construction developments have created a demand for modification of classroom provisions for all subject-matter areas on all grade levels. The departure from the conventional arrangement and treatment of social studies materials has been so pronounced as to necessitate drastic alterations and accretions in space and equipment provisions for this department.

Not long ago, history, geography, civics, economics, and sociology were taught in any classroom which happened to be available at the time when one of these subjects was scheduled on the daily program. In most instances the ordinary desk which permitted no flexibility in seating arrangement, the blackboard, and the bare walls, constituted the setting for the recitation in which the teacher's time and energies were devoted to an attempt to determine to what extent her pupils had memorized the textbook assignment; while the pupils, if well-disposed, repeated mechanically as much as possible of the assigned material in order to please the teacher and to pass the course.

Too often the teacher of such a course was a specialist in science, mathematics, or language who happened not to be assigned to a class in her special field at that period. It was assumed by the authorities and officials that anyone can hear recitations in social studies, and that little equipment beyond the abbreviated textbook need be provided. Specialists were employed for other departmental areas, and elaborately equipped laboratories were made available to favored subjects.

In many progressive school systems, a new day has dawned for the social studies. The reorganization of the curriculum in this field has been so far-reaching as to require a staff of workers who are given special training for teaching these subjects, and to create a demand for a special type of classroom which is equipped with the kind of furniture and apparatus consonant with the kind of activities provided for in this department. In many places it is being recognized by officials and administrators that laboratories are as essential to effective teaching of social studies as they are to the effective teaching of sciences.

In order to make practical application of what is to be said in this article, the housing and equipment provisions for the social studies in a modern junior high school will be described and a few further improvements will be suggested.

The floor plan accompanying the article illustrates only one arrangement of the seating equipment. All tables and chairs are movable, and unlimited flexibility in arrangement is possible.

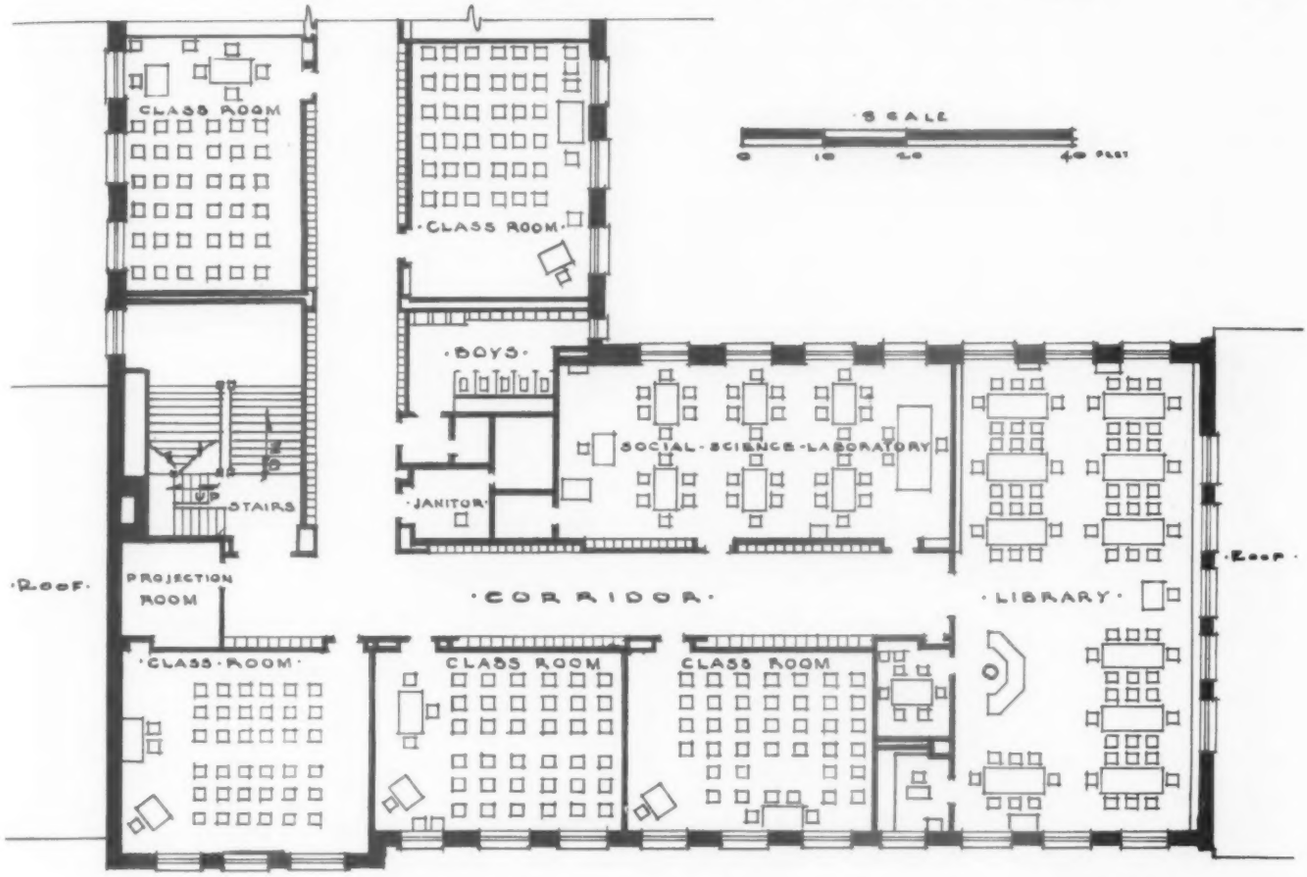
Planning the Social Science Set-up

In an extensive study of equipment requirements for the social studies,[1] the writer found that there is a strong and growing demand for a well-equipped workroom or laboratory in the social studies department in each school enrolling not more than 1,000 or 1,200 students, and additional workrooms for larger schools. Such a workroom is the outstanding feature of the social science set-up to be described in this article. Consequently, more attention will be devoted to this than to other features of the provisions made for the department.

The writer was requested to cooperate with the architect in planning the housing and equipment provisions for the social studies in the University Junior High School on the campus of the University of Texas, and the plan described is the result of the cooperative effort of these two individuals. It is rather unusual for the instructor in the social studies department to be invited to sit in with the architect early enough so that practically all of his suggestions can be incorporated in the plan. Often the one most interested in the arrangement enters the picture only after the opportunity for helpful suggestions has entirely passed; and not only after the plans have been drawn, but after the building has been completed.

In the plan for a new building it is very important to provide for all social science classrooms to be grouped close together and as near as possible to the school library. We were fortunate to be able to achieve these two objectives. It will be observed in the floor plan submitted herewith that the social studies laboratory and one of the other social studies

[1] "The Social Studies Laboratory." Bureau of Publications, Teachers' College, Columbia University. 1929.



Library and social science classrooms form a unit on the second floor of the University Junior High School

rooms adjoin the library, and that the other social studies classrooms are on the same floor and in the same wing of the building. It seems fortunate, also, that the classrooms of the English department are adjacent to those provided for the social studies. This provides unlimited opportunities for effective integration of the social studies with English, which is one of the recognized needs in the modern school.

Since the social studies laboratory is adjacent to the library, it is possible to use the library almost as freely as if it were a section of the laboratory. Many books and other teaching aids which otherwise would have to be kept in the workroom can be used in the library almost all the time, and borrowed easily if occasionally required in the workroom for some special activity. This arrangement reduces the shelving needs and the library assistance in the workroom. Having all the rooms in the department close to the laboratory makes it easy to shift classes from regular rooms to the laboratory at any time when laboratory work is to be done, and facilitates the handling of maps and other materials which are to be borrowed from the laboratory from time to time. This set-up, of course, makes it possible to synchronize and integrate all the activities carried on in this group of kindred subjects. It will be noted that there are small conference rooms adjacent to the classrooms for the use of teachers and pupils in working on projects which would be out of harmony, for the time being, with the regular classroom work. The larger office which is used by social studies teachers and English teachers is on the same floor, but is not shown in this part of the plan.

The Equipment

The floors in all the rooms shown in this plan are of clear hardwood. The legs of all chairs are equipped with metal gliders so cushioned in rubber pads as to make their movements practically noiseless. The ceilings in all the rooms and the corridor are of soundproof materials. The book carriages, the projection stand, etc., are mounted on rubber-tired wheels and casters. In the laboratory, the tables at which the students work are heavy and the legs have wide areas in contact with the floor so that they will not move easily. The chairs being light and tipped with gliders makes it possible for the pupil to push himself away from the table without disturbing others at their work. Thirty-five pupils can get up from these tables and pass from the laboratory with as

little noise as is frequently made by one such pupil in leaving the conventional classroom.

Except for the laboratory, all these rooms are equipped with chairs with broad tablet arm, and book-rack. A single-unit chair-desk or a table and a chair for each pupil would perhaps meet the need better. The laboratory is equipped with tables large enough for four pupils to work at each. Although there are advantages in these heavy tables, smaller seating units would provide more flexibility in seating arrangements. It is also easier with smaller units to seat pupils properly with respect to lighting and for listening activities. There is one medium-sized work table in each of the classrooms, and a very large work table in the laboratory to supplement other facilities.

Each of the regular classrooms is 22 feet wide and 30 feet long. If tables instead of tablet-arm chairs were used, the floor area should be increased 20 per cent to care for the same number of students. Each of these rooms has 125 square feet of blackboard and 65 square feet of bulletin board. It would be much more satisfactory if the amount of space for these two items was reversed. Even 65 square feet of bulletin board space is unusual for a regular classroom for social studies, but it is not enough. And very little blackboard space is required in this field. Each room has an 18-inch strip of cork-board running the entire length of two sides of the room above the blackboard, and an additional unit 3¼x4 feet. One end wall is left for future development. Each room has two sets of maps which remain permanently in the room, in addition to the many which are borrowed, when needed, from the laboratory storage room. All the rooms, including the laboratory, are equipped with units of the public address system, which carries announcements, radio programs, and school or departmental programs. Some of the culminating activities connected with units of work often take the form of reports through the facilities of the public address system. Each of the regular classrooms is furnished with a teacher's desk and chair and a cabinet for classroom library and supplies, the cabinet being built-in flush with the wall. Some of the rooms have additional shelves and other equipment as requested by different teachers for special subject needs. The corridor has built-in lockers except for spaces where classroom cabinets are utilizing the wall cavity from the inside. Semi-indirect artificial lighting is provided.

The Social Studies Laboratory

The most distinctive feature of this physical set-up for the social studies in this school is the workroom or social studies laboratory, which has already been described to some extent in connection with the description of other classrooms. Other features of this room will be described in order to emphasize some of the innovations in equipment requirements in the modern approach to the teaching of these subjects.

The floor area of a social studies laboratory should be at least 50 per cent greater than that of a regular classroom. We were able to hold ours down to that size because of the unusually large amount of space saved by having cabinets and shelves built-in flush with the wall, and by adding a large storage room equipped with shelves and hooks for storage of maps, charts, finished projects, exhibits, supplies and other materials. This storage room opens into the laboratory rather than into the corridor, so that it cannot be diverted to other uses. The north end wall is occupied by the door to this storage room, a loud-speaker connected with the public address system, a steel filing cabinet (dimensions 52 x 27 x 15 inches), and a bulletin board which is 12 feet long and 4 feet wide. Near this wall on the east wall there is a sink for washing some of the materials and the pupils' hands after completing stages in construction projects, modeling, coloring, etc. Between this sink and the nearest window, space is provided for a museum case which is to be added this year. The remaining part of the east wall is nearly all occupied by windows, under which the radiators are installed. There is a little space left near the other end of the room which can be used for the combination magazine rack and dictionary stand.

The south end wall has a large built-in stationary motion picture screen which is exposed only when it is to be used for projection. Note that it is only partly exposed in the picture of this wall. Two sections of blackboard and bulletin board slide back toward either side to expose the screen when needed. At other times this end of the room is occupied by a blackboard over which there are four sections of cork bulletin board 3 feet wide and extending, when combined, the full length of the wall. We should have built a stage at this end of the room.

The west, or corridor, side of the laboratory has a door near each end leading into the corridor, making it possible to bring one group into the room while another is leaving, without creating traffic jams. Near the south end of this wall, as is shown in the accompanying picture, there is a built-in cabinet for the use of the teacher who has charge of the laboratory. It contains about 16 cubic feet of storage space and has two compartments, each equipped with doors which can be locked. Passing beyond the door adjacent to this cabinet, the next feature is a section of bulletin board about 3½ feet square and a section of blackboard 10½ feet long. Above these two panels there is an additional strip of cork-board 18 inches wide. On the molding above this bulletin board, as

The south end of the laboratory. The large built-in stationary moving-picture screen is partly covered by movable sections of blackboard and cork bulletin board

The north end of the laboratory. Note shelves and cabinets set flush with wall, the door opening into the storage room, filing cabinet, bulletin board, and sink

well as on that above the blackboard on the south wall, there is a metal map rail equipped with adjustable hooks which can be spaced to match the eyelets in any kinds of maps and charts. Several single maps and a few sets of maps and charts are usually mounted on the map rail. Above this section of wall covering there is an electric clock which is a unit of the system for special rooms in the building. The transoms on the wall are opaque.

Between the second door and the north wall there is a battery of several types of built-in cabinets, shelves, pigeonholes, and cupboards. Only part of this most useful feature of the workroom can be seen in the picture. This group of filing and storage facilities is 14½ feet in length and 6½ feet high, and the inset into the wall is 13 inches. One group of open, adjustable shelves is provided for books. One large cabinet, with doors which can be locked, is used to store the projection equipment. Several wide, adjustable shelves are used for back numbers of magazines and for certain types of unfinished projects. Other shelves hold models and construction projects. Near the floor there are four large cupboards which can be locked when necessary. These are for storage of museum materials and other bulky materials as the need arises. A tier of drawers provides for several thousand slides and index cards. An enormous amount of space is saved in the room by having so many built-in features. This is only one of the many advantages of planning the entire set-up before the erection of the building.

Although there is a bulletin board area of about 120 square feet in this room and a blackboard area of about 90 square feet, we should be glad to sacrifice more than half of our blackboard space for additional bulletin-board space. Display space is much more in demand in such a room than is space for blackboards.

In addition to the translucent shades, the windows are equipped with opaque shades to be used at projection periods. Electric fans are provided for use when the opaque shades impede the ventilation of the room. Base plugs at each end of the room and two floor electric outlets make it possible to obviate long extension cords, which would interfere with movements about the room during projection activities.

It should be noted that the tables, as shown in the pictures, are crowded more closely together than they are in everyday use, in order to get as much of the equipment as possible into the picture.

There are many series of maps and charts for use in the laboratory and in other classrooms. There are some globes on tripods which should have been suspended from the ceilings. A number of small articles, such as waste baskets, pencil sharpeners, thermometer, coloring and drawing materials, scissors, rulers, paste, etc., complete the provisions for the type of activities which are carried on in the social studies department of our University High School. Such provisions are imperative if the social studies are to be taught effectively.

DESIGN AND EQUIPMENT OF CONSOLIDATED SCHOOL LIBRARIES

By MRS. MARY PEACOCK DOUGLAS

School Library Adviser, State of North Carolina

AS THE functional aspect of the library in the school program looms larger, increasing consideration is given to its design and equipment. Always the potential use of the library in relation to child development should be the controlling factor in the planning of school library quarters. The library in the consolidated school is no different from that in the urban school offering a similar program of work. The points of difference in planning are confined more generally to the type of consolidation. The consolidated elementary school is after all an elementary school functioning much the same as a small city elementary school. The consolidated high school has many of the same problems which the small city high school faces. The consolidated school which houses both elementary and high-school groups in one building offers educational training fairly similar to that of the urban union school. The greatest point of departure between the two is the difference in vocational guidance offerings. This does not greatly affect the physical set-up desirable for the library quarters. In discussing the design and equipment of consolidated school libraries, the three types of consolidation indicated above will be taken into consideration.

Location

In planning a new school building, the library unit should be definitely included. This means, not that so many square feet of classroom space should be allocated, but that a very special library space should be drawn in the plans. The library should be centrally located and easily accessible. No one set of rules will apply for all buildings. Many of the newer consolidated buildings are one story high. It is better to locate the library near the center of traffic in these buildings. A "centrally located" library is not necessarily placed in the physical center of the building. The old idea of putting the library in the quietest and least disturbed part of the building is past. Acoustical equipment can lessen the noise between rooms and halls so that the effect of outside disturbance is hardly to be considered. Rarely is the rural school building set near enough to the highway for passing traffic to cause disturbance. The only outside noise which may interfere is the school playground. With this in mind, it is suggested that the library should not be located to face the athletic field and playground.

If the school building is more than one story high, a number of factors must be considered before the library location is decided upon. The second floor is not necessarily the logical place. If the building is entirely an elementary school or entirely a high school, and if the public does not use the school library as a community library, then the second floor space seems preferable. If these conditions do not obtain, the first floor location is decidedly more desirable. Observation and experience indicate that in a combination school and public library room one of the services suffers. At the same time, it must be admitted that in some localities, unless the school building is used for public library service, there is no satisfactory room for housing and distributing an adult book collection. The location of the school library room under such a plan should be on the front side of the building near the driveway and usually at one end. An outside entrance is desirable, so that the library is accessible even when the school building proper is closed. This same arrangement has proved useful when the library is open for summer reading for pupils, even though an adult collection may not be available.

The first floor corner location appears to be more desirable if only one library room is provided in the building housing both elementary and high-school boys and girls. Ideally, there should be two rooms, one for the younger pupils and one for the high-school group; but this is not always economically possible. The principal factor in locating the school library quarters is the convenience to the largest number of users. Since the space provided for the school library in any building usually becomes inadequate after a few years' use, it is recommended that the library be so located that it can later be enlarged without seriously affecting the general building plan.

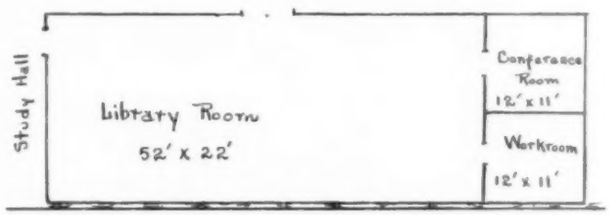
Floor Plan

After a location for the library has been decided upon, the floor space needed must be determined. The most general principle that has been quoted in

regard to this is "25 square feet per reader." That is all very well, but the square feet must somehow result from the combination of width and length. If possible, the library should be wider than the average classroom. A library room the width of a classroom and twice or more its length is difficult to arrange in any but a formal manner. A room a little wider makes a more attractive appearance. If the library is in a line with classrooms and it is not feasible to make the classrooms wider, then the library room will of course make the best of its width. No school library should seat fewer than one class group, regardless of the school enrolment. A simple library room under the supervision of one librarian should not seat more than 100 pupils. Ordinarily, 10 per cent of the student body, if the enrolment does not exceed 1,000, can be seated in the school library room. Connected with the library reading room, there should be space for the librarian's workroom and a conference room. These two rooms can be provided by cutting off 10 or 12 feet at one end of the allotted floor space. The average classroom is 22 feet wide and 32 feet long. Using these figures as a guide for estimating space, it is evident that no school can do with less than the space of one-and-a-half rooms for its school library. Schools limiting themselves to this space find it inadequate. A more desirable minimum is that of the equivalent of two full-sized classrooms. This applies to a consolidated elementary or a consolidated high school. A building housing the elementary and high schools requires additional space.

Supposing that a rectangular space the size of two classrooms has been allotted for the library, how would the space be used? First, 12 feet at one end would be assigned for use as a conference room and a librarian's workroom. This may be equally divided. The two small rooms may be cut off from each other and from the main room by double-faced shelving with glass partition above. There should be an entrance from each of these rooms into the main library. Usually it is preferable to locate the workroom near the windows. An exit from the conference room to the corridor, which would need supervision, is not necessary but could be included. The remaining space of 22 feet by 52 feet would be used for the library proper. Double swinging doors to form one entrance in the center of the corridor wall serves much better than two doors separately located, and also allows better wall space for shelving. If a study hall adjoins the library, an entrance between the two greatly simplifies the procedure for library attendance. If pupils are assigned library periods for reading and research, there is usually no study-hall problem. If the suggestion given regarding the entrance doors is not followed, one should be sure that space selected for doors does not interfere with wall space for shelving, as is the case when the door is placed too near the end of the room.

A crude sketch of the library quarters suggested in the foregoing paragraphs makes the library set-up look somewhat as follows:



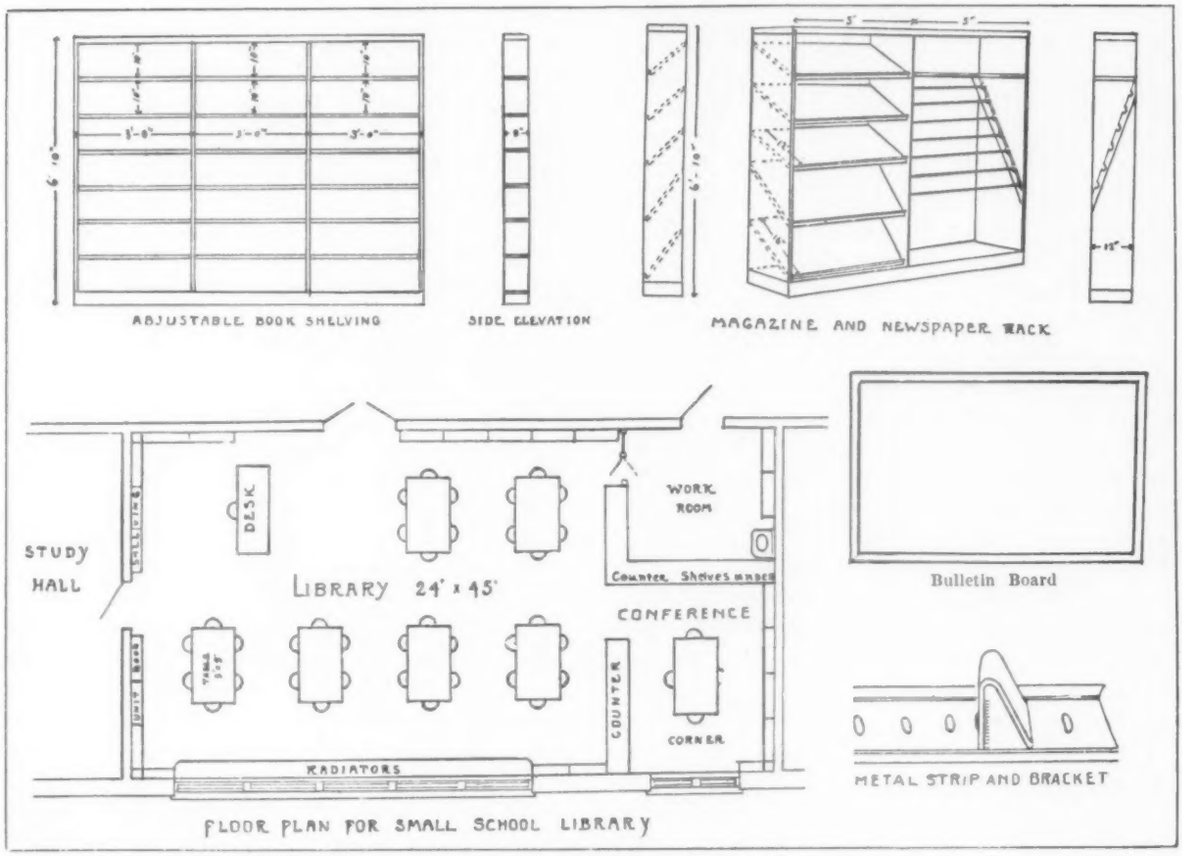
If the elementary and high-school pupils are both served, more space is needed. A most desirable plan is that of the elementary library adjoining that for the high school and separated by counter-height shelving with glass partition above. This provides a place for a classroom teacher to bring an entire class for reading, research, library instruction, or other purposes, without disturbing the high-school group, or vice versa, and yet allows supervision by the librarian in both library rooms.

Decoration

In considering the color scheme for the library room, it is not necessary to adhere to the conservative combination of cream and oak. It is desirable to have the ceiling and walls light and warm enough in color to give satisfactory light reflection in the room. A floor covering is greatly to be desired. Battleship linoleum or any heavy composition material gives excellent service. A mottled coloring which does not show tracks and which harmonizes with the walls and furniture is a satisfactory selection. Color combinations which have recently been used to make the library distinctive have been: oyster white walls and ceiling with a mottled blue, black, and oyster floor covering, and locally built shelving painted black with blue edges; and light buff walls and ceiling with mottled ivory, red, and brown floor covering, and locally built shelving painted brown with red edges. A similar combination could be used with green as the bright color. Venetian blinds a little deeper shade than the walls and with colored tape make a charming change from the schoolroom shades and cost very little more. A pale green or yellow makes a pleasing color for walls. The color combinations used in the library should never be glaring and should always produce a restful room in which one can relax to study.

Stationary Equipment

In equipping the school library, it is desirable, when funds will permit, to purchase from a reliable



Suggested arrangement of equipment for a small school library

library equipment company. When this is done, a representative of the company should be called in to make suggestions and draw plans. Library equipment companies gladly provide this service without additional charge. No discussion such as this can cover all the helps which they can give. The original capital outlay for such a procedure is not always available, so simple specifications must be included here. All suggestions heretofore given have been for the moderate budget, and these regarding locally built shelving apply where funds for ready-made shelving are not adequate. In the first place, all available wall space should be used for shelving. There should be shelving enough to hold a minimum of five books per pupil enrolled. Each regulation shelf holds about 25 books. Shelves should not be built higher than pupils can easily reach. This usually means five shelves for little folks and seven shelves for high-school students. If the base for the shelving is not less than 6 inches, the broom will not brush the shelf when the room is being swept, and less dust will accumulate on it. The specifications for shelving have been repeated so often that one says them by rote, but sometimes the results obtained by carpenters seem to bear little relationship to the glibly repeated phrases. Maybe this time, however, they will work. Building from the floor up, the formula reads:

Base— 6 inches or more
Uprights— ⅞-inch thick and 64 inches high for elementary schools
⅞-inch thick and 76 inches high for high schools
8 inches deep for regular shelves
12 inches deep for magazine shelves and picture-book shelves
36¼ inches between the uprights
Cornice— 2 inches plain, set on top of upright
Shelves— ⅞-inch thick
8 inches deep
36 inches long
10 inches in the clear

With figures given to the quarter of an inch, it is necessary now to specify the exceptions. Several sections should be made with shelving 11 or 12 inches in the clear to care for taller reference books. The terms "section" and "shelf" should not be confused. One section in a high-school library would be made up of seven regular shelves or of six reference shelves. It is never wise to shelve frequently-used encyclopedias on the lowest or highest shelf in a section, for the binding is more easily torn in taking it from the shelf than when it is shelved at hand-reach level. This reasoning applies in planning a complete section for reference books rather than several bottom shelves.

The books on the two lower shelves are more accessible if the shelves are slightly tilted so that the title can be read by a person in standing position.

A small molding must be tacked to the back of the shelf so that the books will not slide to the back.

In deciding exactly how far apart the uprights should be and how long each shelf should be, the wall space available should be calculated. For example, the end of the room 22 feet wide will accommodate seven sections of shelving, using the dimensions above, and allow 3 inches over when space for the uprights is taken out. This small space should be included in one section so that shelving between two uprights will be 39 inches instead of 36 inches; or the 3 inches can be divided so that a fraction of it is added to each section. The 24-foot room will have 2 feet to be divided among the seven sections; or eight sections can be used, each a little less than 3 feet wide.

Adjustable shelving can be provided by the use of metal stripping available from most building-supply dealers. A similar type shelving results from holes bored at half-inch intervals and the use of metal pins.

Magazine shelving built as a part of the wall shelving has proved more generally desirable than the use of separate magazine racks. This type shelving is deeper than regular book shelving and is made of slanting shelves with a front ledge to hold the magazine from slipping. The face of the magazine is visible on the shelves. Newspaper rack sections built-in are also highly desirable.

No library is complete without several conveniently located bulletin boards. In some schools the shelving has been backed with masonite, celotex, or cork substitute so that any section of it can be converted into a bulletin board by taking out one or more of the adjustable shelves. In other schools hinged bulletin boards have been put over the two top shelves of several sections, and the space behind them used for storage. A larger bulletin board with a table below it for displays is most worth while for promotional work.

The equipment for the conference room is similar to that of the main library. The shelving follows the same specifications with the exception of the counter-height shelving between the two rooms, which is not more than 4 feet high.

In the workroom it is better to build the counter-height shelving 16 inches deep and with cupboard doors. This cares for storage of supplies, back issues of magazines, and the like. Regulation shelving should be put on one wall for shelving books in process of being made ready for circulation.

Furniture

In addition to the built-in equipment, there are certain movable pieces of furniture which the room must have. First of these are tables and chairs. It is recommended that these always be purchased from a furniture dealer, either a library supply company or one which specializes in school furniture. Strong furniture reinforced with metal braces is economical because replacement is rarely necessary for many years.

A chair of simple, comfortable design is more satisfactory than a less conventional design. Before buying chairs it is well to sit on one and imagine how it would feel an hour later. Some chairs, pretty to look at, have backs too straight, seats too wide, or a band across the back which cuts into the user. Simplicity in tables and chairs for the school library is the key-word. Tables and chairs for the smaller children should be purchased to fit them. There should be some tables 24 inches high with 14-inch chairs to go with them. The next size is 26 inches with 16-inch chairs. Because there are always some fairly large boys and girls in the elementary school, some tables 28 inches high with chairs 18 inches high will be needed. In the high school, tables 28 inches high and 30 inches high, both with regulation 18-inch chairs, are satisfactory. If odd-sized furniture is preferred, the 25-inch table with 15-inch chairs can be secured. All chairs should be equipped with slides, preferably those with metal base and rubber cushion.

Usually, a table 34 or 36 inches by 60 inches is preferred. Two of these can be placed across a 22-foot room, leaving satisfactory aisle space. A table this size will seat six people, one of whom must face the light. More aisle space is possible if only four or five people are seated at a table. The room 52 feet long will hold 10 tables this size if necessary. If the room is narrower than 22 feet, tables 3x7 feet should be purchased and only one row put in the room. This size table will seat eight people. It is never satisfactory to purchase library tables narrower than 34 inches if pupils are seated on both sides, as too many human feet become entangled under the tables. Round tables provide an attractive variation.

Next to the tables and chairs, the librarian's desk is most important. There is nothing which quite takes the place of a regulation desk. The small room requires a straight rather than a U-shaped desk. Space designed for filing cards, for caring for returned books, for fines, etc., is always provided in the regulation desk. Since these desks are available in all sizes and at varying prices, any school can find a desirable one.

The consolidated school library needs a card catalog case to hold about five cards per book. It needs legal-sized filing cabinets for pictures, pamphlets, and clippings. If only three drawers are secured in the original purchase, be sure that the cabinet can be matched, for more will be needed later. A small book truck is almost indispensable. This can be purchased from a dealer or made by a good woodworker.

Right—Senior High School Library at Durham, N. C. Chairs and tables of suitable height and comfortable design stimulate good study habits

Below—Library at Gastonia (N. C.) High School
A centrally located bulletin board with display shelves provides stimulus for reading interests in this library, which is equipped with locally built shelving

Hospital rollers are desirable on the locally made book truck.

In the workroom, running water is essential. That sentence should be written in red as a warning not to be overlooked. Here, too, there should be a work table and a typewriter desk with a typewriter. Two comfortable chairs would be a minimum.

In the conference room, one table and six chairs can be accommodated. The size of the conference room determines the amount of furniture.

All minimum needs for work have been mentioned; now a plea is made for just one corner which breathes invitation. Let there be one spot for browsing where a cushioned settee, an arm-chair, maybe a fireplace, are found; some place that is a living room designed for reading. A window-seat is inviting. In this corner there is no need for formality. While all the library room should be beautiful and inviting, this spot should be especially so.

Aids in Planning

School administrators, librarians, and architects may wish help and suggestions in planning or evaluating the library set-up in an individual school. In most states the State Department of Education employs someone on its staff who is trained and experienced in schoolhouse planning. The services of such a person are free to residents of that state. Many states employ a school library supervisor who will work with the supervisor of schoolhouse planning in preparing plans for a school library. The services of these people should by all means be used.

The State Library or the State Library Commission always employs someone who can assist with library planning and who can find references on school libraries to be loaned to the school administrator or architect. The American Library Association, 520 North Michigan Avenue, Chicago, Ill., is glad to supply plans and descriptions on request. The Division of Libraries in the United States Office of Education, Washington, D. C., is prepared to give similar service.

Summary

As the library becomes increasingly important in the teaching program, provision for its functional use must be made. The library room should be located so that it is easily available to all users at any time. The library quarters should include a large airy reading room equipped to seat a minimum of one large class group, a librarian's workroom, and a conference room for small group work. The reading-room size should be related to the enrolment of the school, with provision for seating at least 10 per cent of the pupils. Elementary and high-school seating space is better cared for separately. All equipment and furniture should serve the needs of the boys and girls who use them, and the sizes tried and not found wanting should be adhered to. Substitute equipment and furniture is false economy. It is wise to consult authori-

Library at Hendersonville (N. C.) High School
The indirect lighting prevents eye-strain and provides restful light even on cloudy days

Let there be one spot for browsing. Informal, attractive, it should breathe invitation

Courtesy of Gaylord Bros., Inc.

ties who are trained and experienced in school library planning before designing and equipping the school library. And, lastly, the spirit of the library depends on its users. The spirit reflects the human agent. Select the school librarian with care, and then make plans to create a room which will express an invitation to boys and girls to come, to browse, to read, and to study.

THE PLANNING OF THE SCHOOL STAGE

"Splendid school buildings are built in all parts of the country with auditoriums designed to be used for school dramatics, and almost universally they are totally unsuited for this purpose."

Milton Smith in "The Equipment of the School Theatre."

By GEORGE W. EBEY

Director of Dramatics, Kamehameha Schools, Honolulu, Hawaii

THE quotation above finds ample illustration in many cases of unsuitability in school stages which have come to my attention within the past year. A few of these instances are presented here:

1. The stage of High School A, in Honolulu, T. H., is so high in relation to the auditorium floor that people sitting in the first five rows cannot see the actors from the knees down. Also, the architect conceived the idea of placing a pair of huge scenery doors in the center of the stage's back wall, so that the wall is irrevocably incapable of being utilized for skylighting effects. Incidentally, the doors were so high above the ground level that an expensive roadway had to be elevated to them. The same architect, however, overlooked the need for ante-proscenium lighting, so that the front spotlights obviously are afterthoughts.

2. The recently dedicated auditorium of High School B, in Honolulu, T. H., because of the meticulous care of an efficient comptroller and participation in planning by interested faculty members, approaches the school producer's dream—except that the ante-proscenium lights never were intended for the purpose and will be almost totally unusable, and that a great deal too much money was expended for an elaborate border lighting system. Even these undesirable features could have been avoided if democratic planning had been initiated earlier.

3. The stage at High School C, New York State, is too shallow for its width and is further handicapped by a switchbox and a pair of radiators against the backstage wall.

4. High School D, New York State, is fortunate in having a spacious stage, but far too much money has been expended in the installation of three inflexible, stage-width border lights and of 24 1,000-watt spotlights in such a position in the auditorium ceiling that they can be focused only on the apron of the stage. Also, two work lights make the back wall of the stage useless for skylighting.

5. The architect who planned the stage in High School E, New York City, evidently was aware of the desirability of stage height, but he failed to include I-beams or a gridiron from which scenery could be flied, thereby making the stage cubic footage above the proscenium arch almost a total waste. In addition, a very expensive switchboard was installed, but it included not a single dimmer.

6. The new $600,000 University A theater is an elaborate artistic creation, but the main floor of the auditorium has so little slope that one sitting in the main orchestra section must crane his neck to enjoy anything but the hair trim of the spectator ahead.

But why go on? These examples have been selected from the group of better school stages. They are vastly superior to the hundreds of misfits below the median on the scale, which serve only to restrict the development of adequate school dramatics programs throughout the country. Yet it can readily be seen that through introducing greater care in initial planning, and through utilizing the accumulated experience of those who eventually must use the unit, even these stages might have been improved greatly.

One thing is certain. With the increase in emphasis upon constructive activities in the curriculum, the modern school stage must be planned less with regard to getting every senior near the front of the stage at graduation time and more as a school unit to implement music, art, and drama activities. It is with this conception of function that the suggestions included here, though by no means exhaustive, are presented to assist him who contemplates planning a school stage.

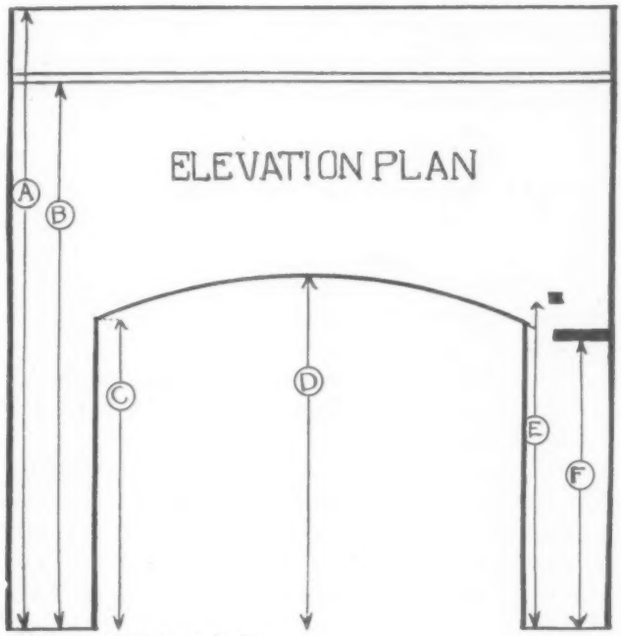
General Considerations

Stage Proportions.—Probably the first questions to arise are: What should be the cubic footage of the stage? How should this cubic footage be distributed? What should its relation be to the height and width of the proscenium opening?

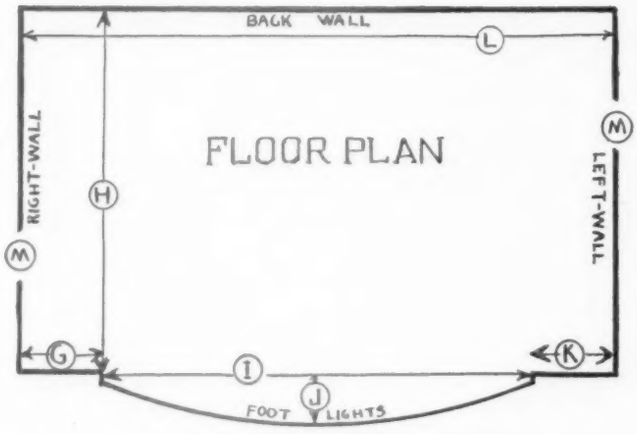
Claude B. Hagen, construction engineer for Century Theatre, has worked out a "rule of seven" for the building of professional stages.* The following dimensions depart from this general relationship only very slightly in presenting a possible plan which provides for adequate height, depth, and backstage working space:

	Feet
Proscenium width	30
Proscenium height	20
Width of stage	50
Depth of stage	25
Height to ceiling	56
Height to gridiron	49

* See Smith, Milton: *"The Equipment of the School Theatre,"* p. 52.

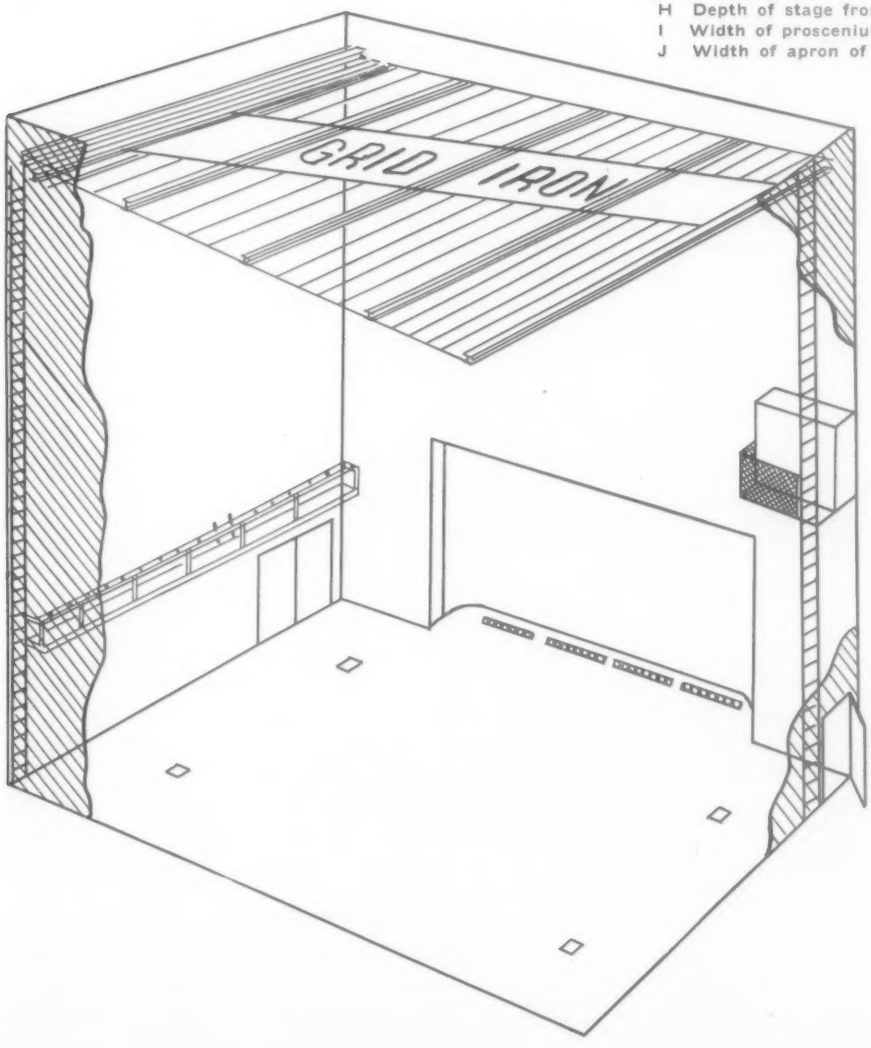


Courtesy of Tiffin Scenic Studios

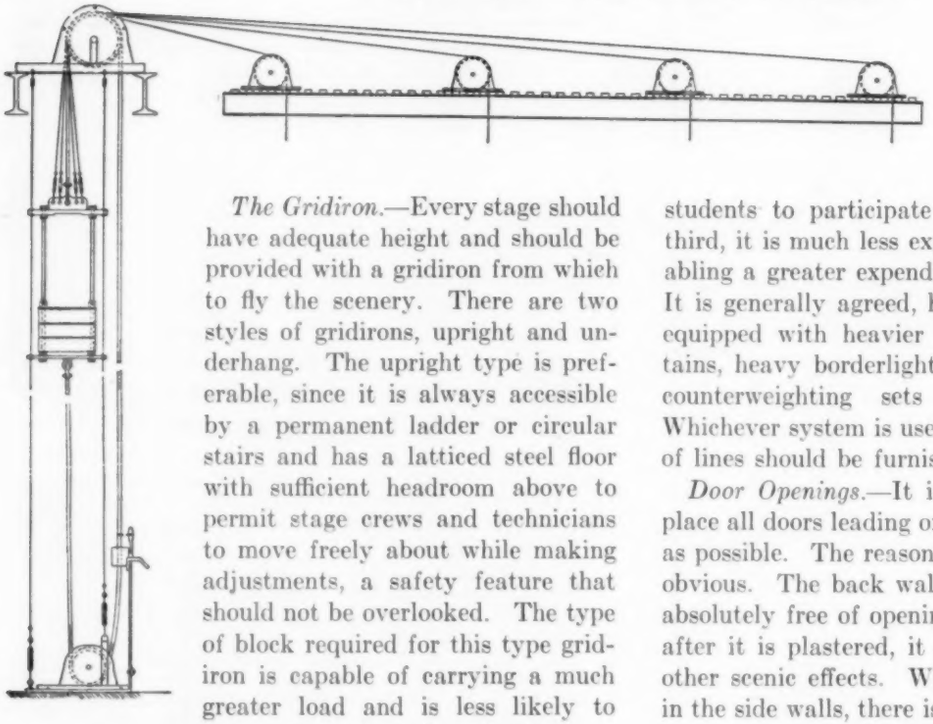


Left and above—In planning any given stage, careful attention must be paid to certain relationships so that the proportions will be correct. Particular care should be used in working out the following dimensions:

A Distance from stage floor to ceiling.
B Distance from stage floor to rigging loft.
C Height of proscenium arch at side.
D Height of proscenium arch in center.
E Height of pin, or tie-off rail from stage floor.
F Height of fly floor from stage floor.
G Distance from right side wall to proscenium opening.
H Depth of stage from proscenium wall to back wall.
I Width of proscenium opening.
J Width of apron of stage from footlights to curtain line.
K Distance from left side wall to proscenium opening.
L Width of entire stage at back wall.
M Width and height of doors in side walls of stage; also distance from back wall. (In this rough drawing the door in the left wall is farther upstage than necessary.)



Left—A properly planned stage will greatly implement the program of a modern high school or university. This sketch suggests one possible arrangement for achieving maximum safety and flexibility



A typical counterweight set
Courtesy of J. R. Clancy, Inc.

The Gridiron.—Every stage should have adequate height and should be provided with a gridiron from which to fly the scenery. There are two styles of gridirons, upright and underhang. The upright type is preferable, since it is always accessible by a permanent ladder or circular stairs and has a latticed steel floor with sufficient headroom above to permit stage crews and technicians to move freely about while making adjustments, a safety feature that should not be overlooked. The type of block required for this type gridiron is capable of carrying a much greater load and is less likely to loosen up through vibration or other causes. The possibility of failure of this type of equipment is very remote; however, should such failure take place, nothing serious could happen, since everything is above the gridiron and nothing could fall to the stage. With the underhang type the conditions are just the reverse, as everything hangs underneath the gridiron and in the event of failure would instantly fall to the stage and in all probability cause damage or injury. The chief objection to the underhang gridiron, however, is that each and every adjustment or change must be made from a ladder from 30 to 50 feet high, which in itself is dangerous. Also it is very difficult to get the ladder up between the scenery and border lights once the stage has been rigged. It is therefore obvious that the equipment will never get any inspection or adjustment unless "something happens." Only the very best quality steel head blocks and loft blocks should be installed in either case, for faulty rigging equipment may result in irreparable damage.

Whether to install a counterweighting system for flying and lowering scenery is a question to be decided in the light of all the circumstances. Some modern high-school stages are so equipped, and some stage experts recommend the inclusion of such a system. However, there remain some arguments in favor of the human-powered system for the high-school stage, especially if the gridiron is only moderately high. First, it is less inclined to get out of hand, consequently being safer for relatively inexperienced stage hands. Second, it requires a greater number of stage hands for its operation and therefore enables more students to participate in stage productions. And, third, it is much less expensive to install, thereby enabling a greater expenditure more usefully elsewhere. It is generally agreed, however, that when a stage is equipped with heavier units—such as asbestos curtains, heavy borderlight units, traveler tracks, etc.—counterweighting sets are almost indispensable. Whichever system is used, though, at least twenty sets of lines should be furnished.

Door Openings.—It is considered best practice to place all doors leading onto the stage as far downstage as possible. The reason for this arrangement is quite obvious. The back wall of the stage should be kept absolutely free of openings and fixtures in order that, after it is plastered, it may be utilized for sky and other scenic effects. When doors are placed upstage in the side walls, there is always the problem of keeping extraneous light from adjacent hallways or rooms from ruining the dramatic effect achieved on the stage.

It is likewise important that there should be a door on each side of the stage, so that actors or technicians can enter the backstage area from either side during a performance without crossing the stage. In the opinion of some directors, one of the openings should be a pair of large scenery doors. Although doors of this size are not absolutely essential, they facilitate offstage storage of scenery needed during a given performance. The downstage door of the pair can be used for the entrance and exit of participants, though some stage planners may find it convenient to cut a smaller door inside the large one for this purpose.

Elevated Pin Rail and Switchboard.—Just as reliability and validity have been characterized as twin infants who are constantly questioning the research man, so one might picture safety and flexibility as the twin inquirers of the stage planner. They are of primary importance, though the former must justly be considered the more voluble twin. Safety is one factor responsible for the suggestion that both switchboard and pin rail be elevated. Equipment of this type serves its function best when its tempting gadgets are removed from the area where meddlesome, inexperienced fingers can jeopardize human life and physical equipment. Of course, good sense dictates that both the pin-rail balcony and the electrician's perch should be carefully fenced in.

Besides the safety factor, there is an additional advantage in having the switchboard elevated; it enables the electrician to coordinate the lighting effects and stage action with much greater efficacy.

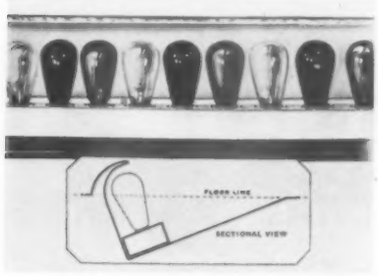
Lighting Equipment

After inspecting the general proportions of the stage, the director of dramatics almost immediately turns his attention to the lighting equipment, for it is upon this equipment that he must depend for the creation of atmosphere in his productions. It is in this area, too, that architects have proved to be notoriously weak, frequently burdening a new stage with expensive, inadequate, inflexible equipment.

Footlights.—Although a great many Broadway successes in recent years have been produced with anteproscenium lights usurping the function of footlights, the latter still are considered indispensable for the general use to which the high-school stage is put. The problem in planning the high-school stage is not whether to include footlights, but rather what type will be most practicable. The old style, permanent, open-trough type which replaced the gas lights at the turn of the century, and the permanent, semi-open trough type, are considered definitely inferior for the high-school stage. In newer playhouses and auditoriums the disappearing type with individual reflectors and glass roundels is fast becoming standard.

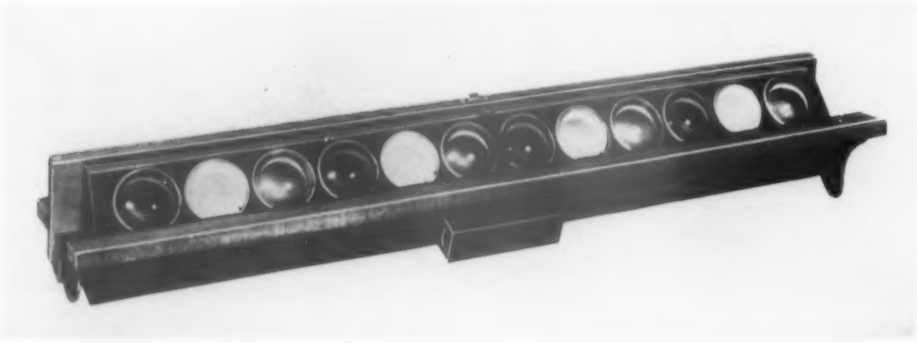
Disappearing footlights usually are installed in sections, the number of sections needed to tone the stage sets depending upon the width of the stage. For a stage 30 feet wide four sections, each containing nine reflectors, are recommended.

Border Lights.—The type of light which is used, generally in conjunction with footlights, to tone the set is the border light. It is with this variety of light equipment that manufacturers in the past have been guilty of encumbering schools unnecessarily. The lighting diagrams of some older companies still call for three rows of borders (at about $10 a foot) stretching clear across the stage. In modern play production, when lights are used to create atmosphere, the second and third rows of borders are more a hindrance than a help. Among the most successful directors of amateur dramatics of my acquaintance, one uses no border lights whatsoever, and a second has junked the second and third rows with which his stage was equipped and plans to eliminate the first row as soon as finances permit the substitution of baby spotlights. Most directors, however, still feel that for general purposes two 5-foot sections, flanked by batteries of baby spotlights to form a concert border, are highly desirable. All of them probably would agree that additional flexible units for skylighting and special effects are almost indispensable.



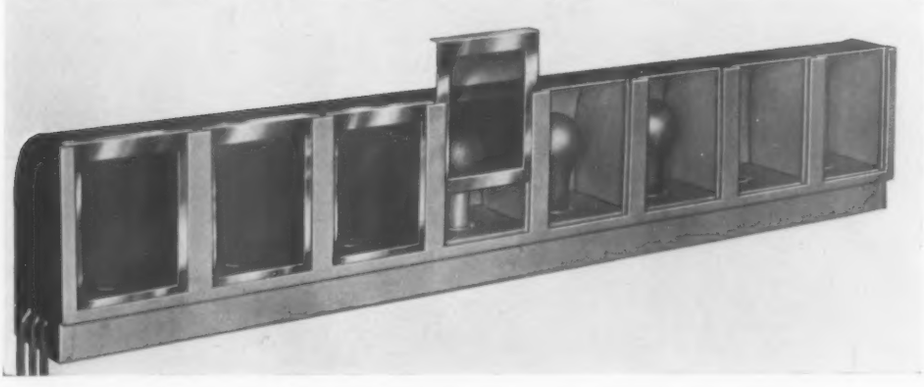
The old-style, permanent, open-trough footlight

Courtesy of Kliegl Bros.



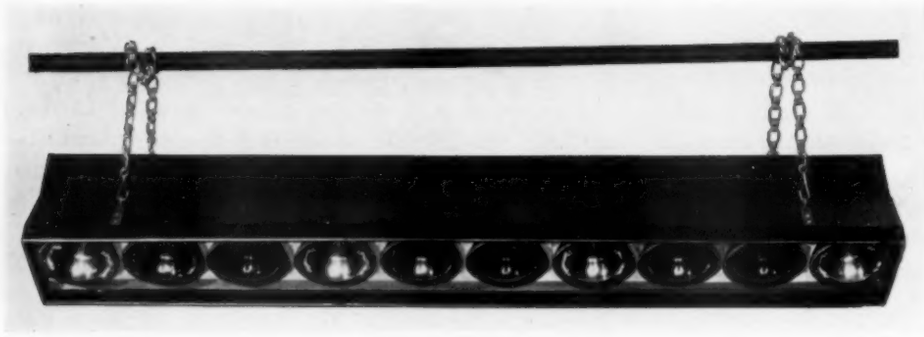
The disappearing type of footlight, with individual reflectors and glass roundels

Courtesy of Kliegl Bros.



A portable footlight of the compartment type

Courtesy of Capitol Stage Lighting Co.

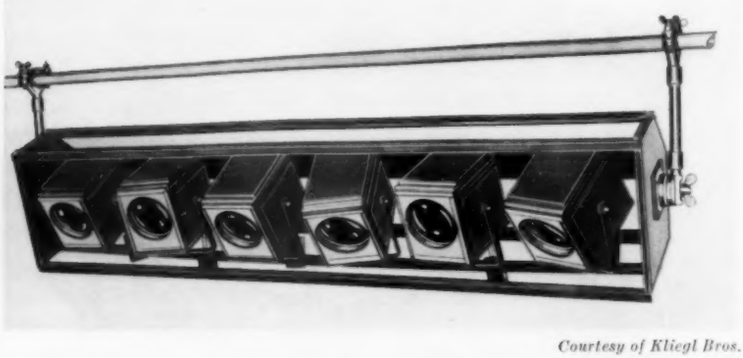


Left—A border-light section of the latest type. Border-light units should be supplied which provide maximum flexibility

Courtesy of Capitol Stage Lighting Company

The question of the type of border light to purchase naturally arises at this point. Various types are available—the open trough type which permits the light to mix in the trough, the compartment-type requiring gelatine slides, and the newer compartment-type with glass roundels. The choice must be made with respect to the circumstances which exist in a given situation. The open trough type is considered definitely inferior for most purposes. The newer compartment-type is thought by some to be less flexible than certain other types, though for a junior high school, which usually does not aspire to the professional level in its productions, this type may be most satisfactory. The compartment type requiring gelatine slides is highly recommended for both its efficiency and its flexibility, having been used with great success by a prominent Eastern university. Two six-outlet sections are included in the high-school stage plan, and three six-outlet sections should be added for sky lighting and special effects.

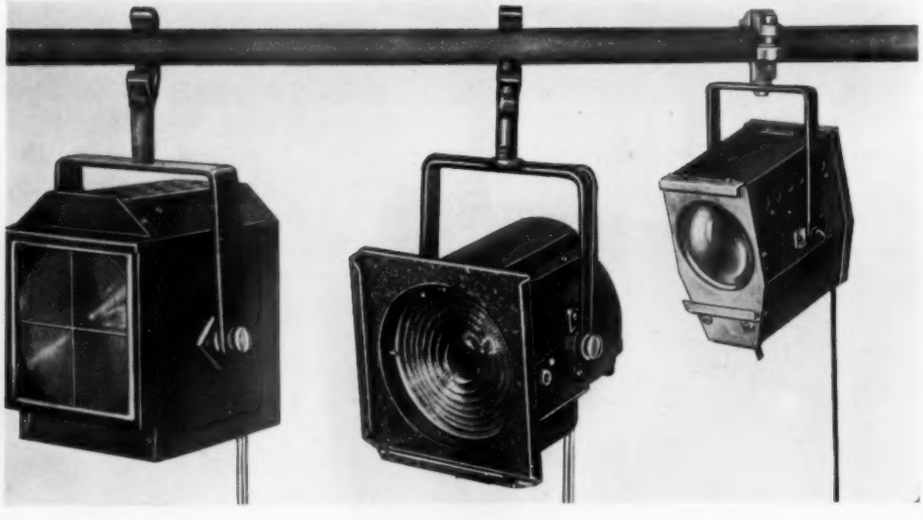
Border Spotlights.—While footlights and border lights tone the stage, the spotlight serves the purpose of highlighting the important acting areas. This function usually is assumed by the baby spotlights in the concert border, though frequently ante-proscenium spotlights make a contribution here. Eight baby spotlights, four on each side of the border lights, should be a minimum for the high-school stage.

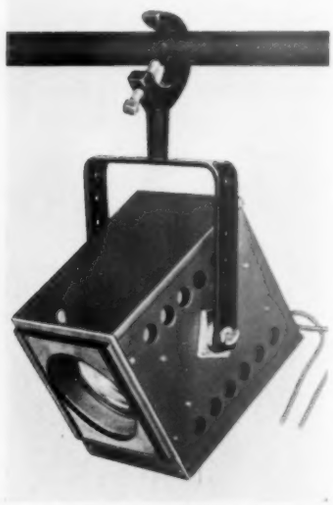


Left—Portable spot borders, or bridge spots, produce special lighting effects

Below—Baby spotlights are used in the concert border to highlight important acting areas

Courtesy of Kliegl Bros.



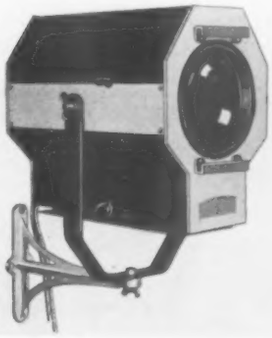


Courtesy of Capitol Stage Lighting Company

The type of baby spotlight to include will be determined by the amount of money available. The price range runs from $7.50 to $30. One prominent company manufactures a $12 baby spotlight which gives satisfactory results. It is probably good economy, however, to purchase baby spotlights of better quality, since they will be among the most frequently used units on the stage.

Ante-proscenium Spotlights.—The front spotlights require a good deal of planning on the part of the architect, for it is highly desirable that they be concealed in some part which appears to belong to the total arrangement of the building—such as a false beam or pillar, the front of a balcony, or a chandelier. These locations must be selected in such a way that the function of front-lighting will be most adequately fulfilled, and at the same time they must be easily accessible for adjustments by technicians.

The chief functions of ante-proscenium lighting are to supplement border spotlights in highlighting acting areas back of the proscenium arch, to kill border-



Left—A familiar spotlight of older design

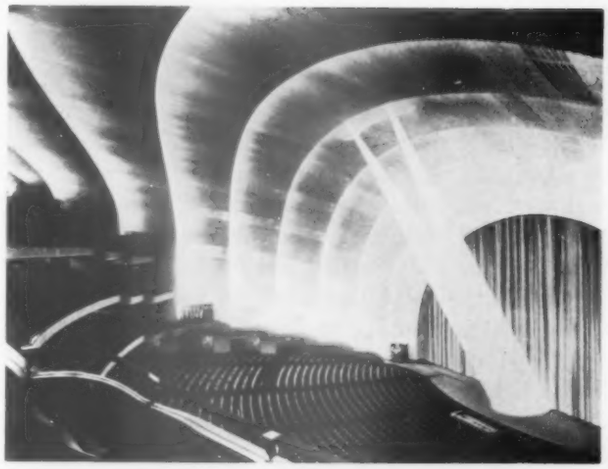
Courtesy of Kliegl Bros.

Right and below—Modern spotlight designers have provided units of greatly increased efficiency

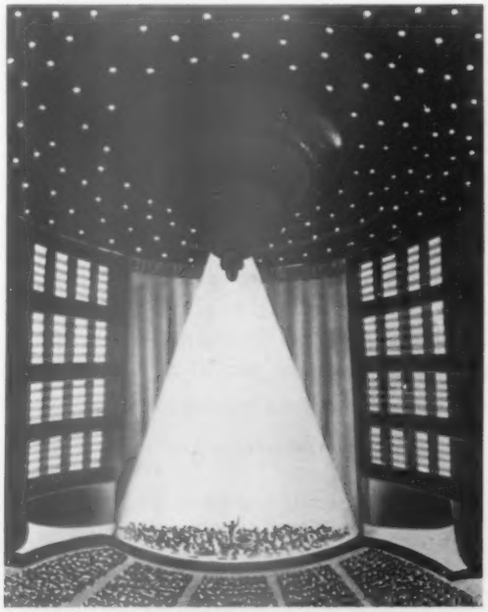
Courtesy of Kliegl Bros.

Left and above—Units of this type are highly recommended for ante-proscenium spot- and flood-lighting

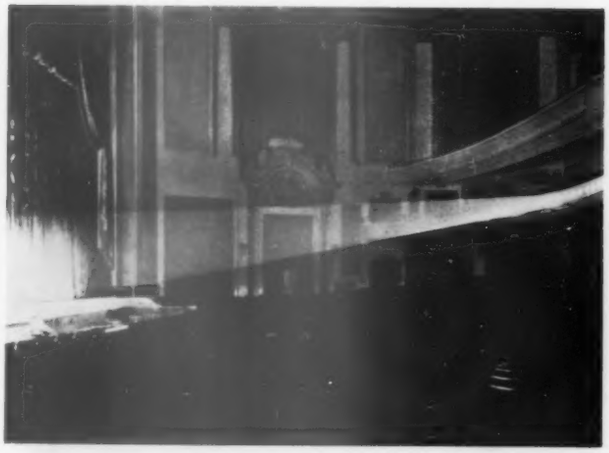
Courtesy of Century Lighting, Inc.



Front lighting from overhead, above false ceiling, Music Hall, Radio City, New York



Front lighting from chandelier, Center Theater, Radio City, New York



Front lighting from balcony rail in a typical theater

Illustrations above by courtesy of Kliegl Bros.

light shadows caused by action too near the apron of the stage, and to assume major responsibility for any lighting in front of the proscenium arch. This requires that the beam should come at an angle, but not at such a sharp angle as to restrict its usefulness to a limited area. It also demands a light which can both spot and flood with maximum efficiency.

One of the most annoying elements for directors is what is commonly termed "light leak." The next time a front spotlight is turned on, notice whether all of the light is confined to the main beam or whether the whole front of the auditorium is bathed in reflected light. If the latter is the case, you will know that you are observing "light leak," the result of bad spotlight engineering. Two New York light firms manufacture recently developed ante-proscenium spotlights which eliminate this undesirable feature and are considered to be the most flexible and efficient units on the market at the present time. Four to six of these should be provided for the well-equipped high-school stage.

Additional Lights.—From the standpoint of securing most usable lighting equipment, it probably would be sound practice to set aside a fund for the purchase of desirable units after the building has been completed and the needs have arisen. It seems fair to assume, however, that another flexible type of equipment should be included in the original plan. This is the stand type floodlight; it has a multitude of uses and is considered an essential part of any stage equipment. At least two of them, and preferably three or four, should be a part of the initial equipment.

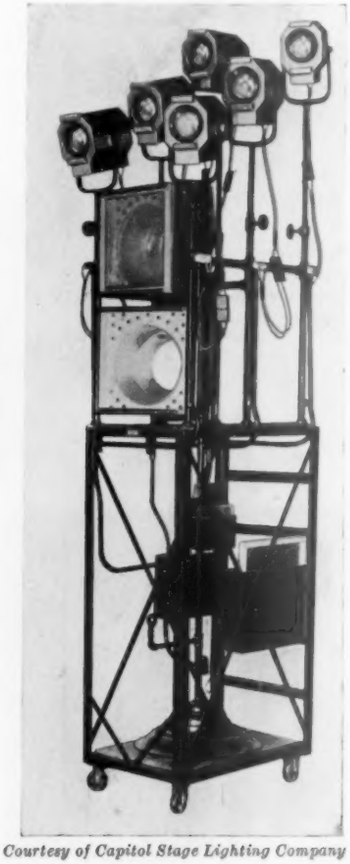
Switchboards—General Suggestions

There are certain generalizations applicable to all stage switchboards; every individual light or series of lights should be wired with its own light switch and dimmer; master switches and dimmers should be included either to black out or to dim the entire stage at once; and provisions should be made to accommodate extra outlets should they prove desirable at some future date. All the major reputable lighting firms carry acceptable switchboard equipment; however, considerable sums frequently are saved when—as in the case of High School X, Honolulu, T. H.—the school's electrical and dramatics departments cooperate in designing and installing the stage's own switchboard.

In closing, it may be well to make two suggestions which may be characterized as almost axiomatic: (1) the stage floor from the curtain line to the back wall should be of soft wood to make possible the use of stage screws, and (2) the curtain control should be located on the same side as the switchboard so that the director of dramatics can give directions to both operators at once. The latter is especially necessary in the event of an emergency, and emergencies sometimes do arise even in the best of productions.

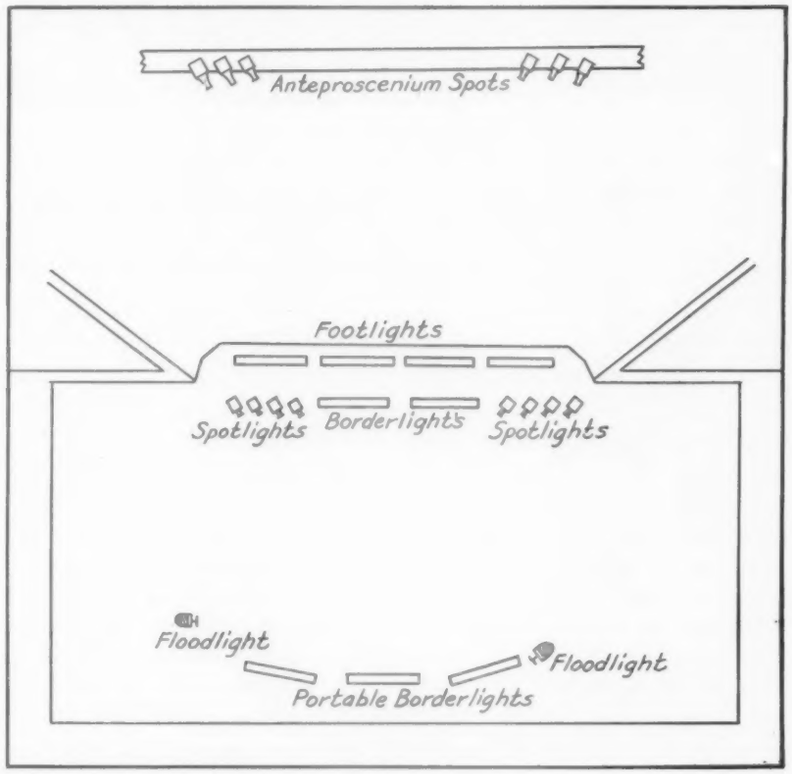
Right—A light tower has a multitude of uses when productions approach the professional level

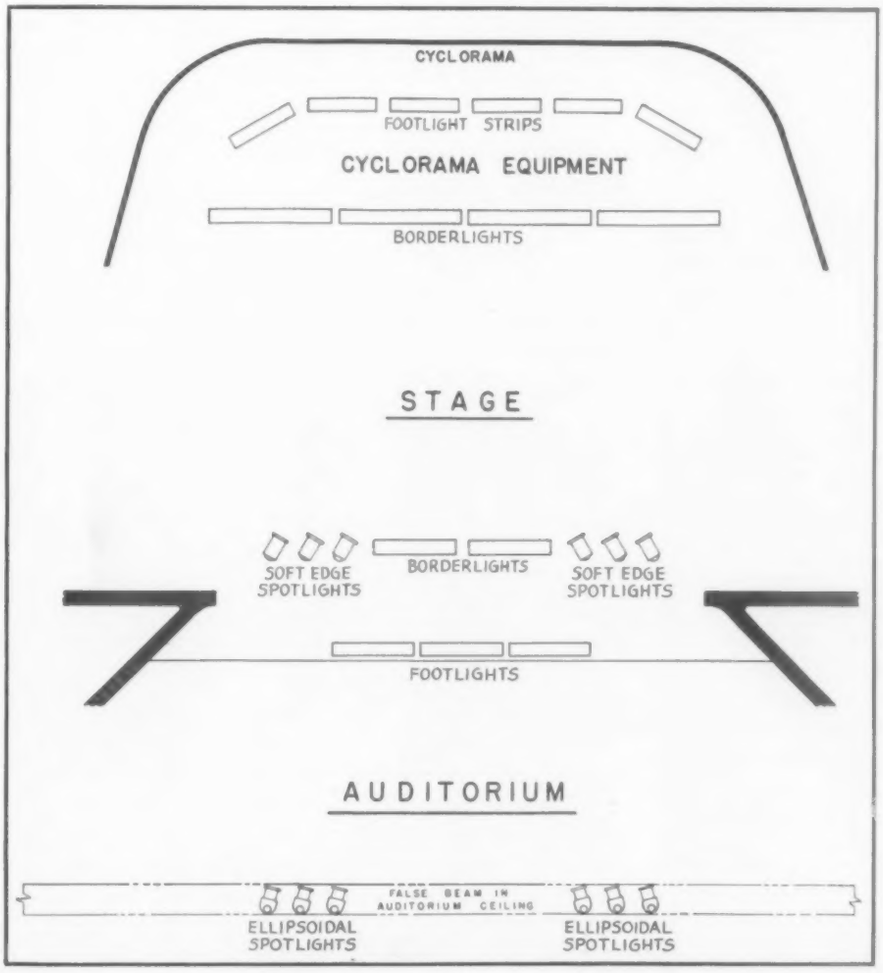
Below—Portable switchboards enable small high schools to achieve high standards at a minimum cost



Courtesy of Capitol Stage Lighting Company

The stage lighting layout shown in this rough sketch may be modified as necessary to meet the problems peculiar to any given theater set-up





A stage lighting layout planned with the medium-sized theater in mind (Stage: 40 ft. wide by 25 ft. deep; proscenium: 24 ft. wide, 16 ft. high)

Courtesy of Century Lighting, Inc.

BETTER FILM DISTRIBUTION THROUGH ORGANIZATION

By CHARLES F. HOBAN, Jr.

Director, Motion Picture Project, American Council on Education

WITH the organization in June, 1938, of the Association of School Film Libraries, Inc., an attempt is being made by educators to solve many of their problems of film distribution through co-operative action. The incorporation of the Association followed a series of conferences, held under the auspices of the Motion Picture Project of the American Council on Education, to which educational film producers and distributors were invited, to discuss their mutual problems and to work out ways and means by which these problems could be solved. The Association itself has been organized independent of the Council and is composed of schools, colleges, and other educational institutions which are distributing educational motion pictures on a local, state, or regional basis. Offices have been established in New York, the business center of the film industry, in the Time and Life Building, 9 Rockefeller Plaza. The Executive Director of the Association is Fanning Hearon, formerly Director of the Division of Motion Pictures of the United States Department of the Interior. Within three months following the opening of the New York offices, 25 of the largest universities and city school systems maintaining film libraries became active members.

The Association's Purposes

The Association was organized primarily to act as a clearing-house between the film producer and the film user. The person directly responsible for getting films into the classroom when and where they are needed has had to maintain catalogs of hundreds of sources of educational films, and to deal with each of these sources independently in order to build up an adequate library. On the other hand, the film producer has had to load his films into his car and literally peddle them around from institution to institution. Thus, the costs of distributing films have often far exceeded the costs of their production. At the same time, directors of visual instruction have been swamped with the work of keeping abreast of innumerable educational film productions, and have been unable to devote attention to supervising the use of films in the classroom and developing in-service programs for teachers. Consequently, use of the motion picture in education has often been at a standstill because for the producer the business is essentially unprofitable, and for the consumer it isn't worth the candle.

Specifically, the Association is organized for these purposes:

1. To receive and distribute information on films available and acceptable for education, with particular attention to new films, comparatively unknown films, and films heretofore unavailable to education. This involves the systematic dissemination of accurate descriptions of film contents and whatever evaluations have been made by various groups of educators. The information will be sent out in loose-leaf form which, when collected, will constitute an up-to-date catalog of films and fresh news on what is going on in the educational motion picture business.

2. To act as an agent for its members in the purchase, lease, or rental of films. This function of the Association is intended to reduce the transactions which institutions must carry on in their normal acquisition of film materials. There is no intention, however, to interfere with existing distribution agencies or to take commissions away from field representatives.

3. To open new sources of films to education.

4. To provide a permanent organization to carry forward such activities as determining the needs of its member organizations for film subjects, and to help producers and distributors find an organized audience and a stabilized market.

One of the most important things the Association is doing is to open up sources of films which have previously been closed to education or not readily available. The bulk of commercial production has been carried on by the Eastman Kodak Company, Teaching Films Division; Erpi Classroom Films, Inc.; Bray Pictures Corporation; and a few others. Expanded production by these concerns has been restricted through lack of distribution facilities for the films already produced, and in many cases educational film producers have operated at a loss for many years. Recently there has been a renewed interest in new production, and success of continued effort by these concerns depends on the establishment of a stable market, capable of returning more than production costs. Eastman has just released six new films dealing with social studies and science, and Erpi has undertaken production of twenty new films, primarily in the social studies, during 1938.

New Sources of Films

However, there are a number of sources of films which have never been opened or have not been used to their full extent, primarily because there has been no centralization of distribution facilities for the educational films. Some typical examples of these other sources which may now be opened through the Association of School Film Libraries, Inc., are as follows:

(1) *Commission on Human Relations, Progressive Education Association.*—Under the chairmanship of Miss Alice V. Keliher, the Commission on Human Relations, Progressive Education Association, has edited for classroom use approximately 50 feature theatrical films dealing with important problems in human relations, has tested them experimentally in public and private secondary schools and colleges, and is now about ready to release them for use in discussions of human relations, social studies, and psychology. The films include episodes dealing with mob activities, with professional and marital choices, with parent-child relations, and the like. Original films from which these classroom versions were edited include "The Story of Louis Pasteur," "Fury," "Men in White," and "Black Legion." Release of the films has been obstructed by the fact that up to the present time there has been no non-commercial educational distribution system provided on a national scale. The Commission is unwilling and, by contract, unable to release the films through commercial distributors which maintain only rental libraries and do not deposit films for indefinite periods with schools and colleges.

(2) *Theatrical Shorts.*—Under a grant of $50,000 from the Motion Picture Producers and Distributors of America, Inc., an educational advisory committee in the summer of 1937 undertook a survey of theatrical short subjects to determine the extent to which any of these films were of value to education. A series of reviewing panels, composed of classroom teachers from public and private schools of the country, selected for preview a list of 2,000 films from 10,000 short subjects produced during the past ten years. Of the 2,000 subjects previewed, a list of approximately 900 subjects (including Eastman, Erpi, Gaumont-British instructional, and foreign instructional films) was recommended to producers for release to schools and colleges because of their educational value. The recommended subjects include the best of the travelogs, the Walt Disney productions, and such other subjects as "Perfect Tribute," "Servant of the People," and "Give Me Liberty."

To date, these materials have not been released to schools, for at least two reasons: first, the theatrical distribution system is not adapted to educational needs; and, second, major producers hesitate to establish a separate educational distribution system because of the high overhead cost involved and the unstable market for educational films.

(3) *Foreign Films.*—Use of films for teaching foreign languages and cultures, development of better international understanding through the use of foreign films, study of advanced film techniques used abroad, and utilization of basic instructional films produced in other countries, have been at a practical standstill in the United States because it has been impossible for schools and colleges to secure these films without excessive costs. Excellent teaching films produced in England have gone begging in the United States because of lack of distribution facilities. French and German films have been available to high schools and colleges but only at high cost and generally in 35-mm width. One of the major British educational film producers, the Gaumont-British Corporation, has established a branch office in the United States and has offered its instructional films for sale to schools, but the market is still so unsettled that the venture has not been definitely successful.

(4) *University Production.* — Many universities throughout the country have produced films for use on their own campuses which are also of value to other universities and to secondary schools. Ohio State University, for instance, has produced 75 films; the University of Minnesota, 25; the University of Wisconsin, 35, etc. Early in 1938 The General College of the University of Minnesota received a grant of $122,260 from the General Education Board for the production of twelve new films intended for general education. These will be an experimental departure from the typical classroom film and will utilize dramatic techniques in an attempt to engender a deeper personality reaction than has been found possible through the use of straight factual films. When completed, the films will be of value to schools and colleges other than the University of Minnesota, but the University is in no position to undertake national distribution.

(5) *Independent Producers.*—Some people are producing good educational films independently. For instance, the Woodward brothers have produced an exceptional film on rural life in Mexico from a child's point of view, called "The Adventures of Chico," which has many possible uses in the school curriculum. Other independent producers have made films on the territorial expansion of the United States, aviation, and other modern problems, but the films have gone begging to the schools because there has been no educational film distribution system which could make them available to the classroom in a way approved by educators.

(6) *Government Production.*—Several Government bureaus have produced films of intense interest to educators. Two of the finest educational films yet

produced in America are "The Plow That Broke the Plains," and "The River." Both were produced under the direction of Pare Lorentz by the Resettlement Administration and by the Farm Security Administration, respectively. The United States Department of the Interior has produced many significant films showing the geography and people of the islands and territories; preservation and development of the national and state parks; C. C. C. projects; and the Indian reservations. Its Virgin Islands film, "In the Wake of the Buccaneers," finds many uses in the classroom. Many of the best of these films have escaped the classroom, however, because of lack of distribution facilities. The Farm Security Administration, for instance, has met its problem of *theatrical* distribution by turning "The River" over to Paramount, but as yet there has been no announcement of plans for educational distribution.

(7) *Industrial Sources.* — Occasionally, industrial concerns produce films which are free from objectionable advertising and can be used without reservation by schools and colleges. Such a film is U. S. Steel's "Men Make Steel." While industrial concerns often maintain their own distribution systems, there has been no existing organization which sorts industrial distribution into the good and the bad. For every good educational film produced by the industrial concerns there are a dozen containing objectionable advertising, and the school user often must take the bad with the good. Free distribution of industrial films has become a center for considerable agitation in educational circles, and many educational film distribution libraries are eliminating industrial films. However, such drastic action deprives education of good films as well as saving it from bad ones.

The opening of these several sources to education is one of the most valuable services that the Association of School Film Libraries, Inc., can perform for its members. The Association is purely a service agency, incorporated by its membership and financed in part during its first year under a grant from the General Education Board. This grant is being administered by the American Council on Education. The members of the Board of Directors during its first year are: J. C. Wardlaw, University System of Georgia, President; Boyd B. Rakestraw, University of California, Vice-President; Harold C. Bauer, Northwest Audio-Visual Committee; Thomas Fansler, New York University; Charles F. Hoban, Jr., American Council on Education; John A. Hollinger, Pittsburgh (Pa.) Public Schools; and Paul C. Reed, Rochester (N. Y.) Public Schools.

ERPI CLASSROOM FILMS INC.

Formerly Erpi Picture Consultants Incorporated

35-11 Thirty-fifth Avenue, Long Island City, New York

All motion pictures are educational if education is thought of as life experience. However, distinctions exist between films prepared for entertainment purposes, those assembled for novelty or survey presentation, and the **teaching film** produced specifically for classroom use.

No one will deny the educational value of selected feature pictures when shown in the theatre or school auditorium. Certainly travelogues, news reels, documentary subjects, novelties and the like, possess general, and in many cases great educational value and may be used to vitalize auditorium assemblies or provide material for noon hour recreation and club activities.

However, the properly prepared **teaching film** is produced as an integral part of a unit of instruction that has a definite relation to a course of study being taught by the individual teacher. It emphasizes the salient features of a specific body of subject matter and is employed by the skillful teacher for a particular or combination of purposes—

(1) to stimulate interest in the introduction of a new unit of instruction,
(2) as a direct teaching aid in presenting major concepts of a unit which is otherwise difficult or often impossible to present,
(3) to enrich or extend the content of a unit,
(4) to summarize or review a unit's work.

Obviously, such a film should be utilized quite differently, and more frequently, than "just a motion picture" if optimum benefits are to accrue.

BIOLOGICAL SCIENCE SERIES

Plant Life

1. Plant Growth—Entire story of the pea plant from germinating seed to scattering ripened seed. Pollination and fertilization by natural and time-lapse photography and animation.

2. Roots of Plants—Various forms, structure and growth, time-lapse and microphotography. Functions of root-cap and root-hair, with relation of osmosis to water absorption by roots.

3. Leaves — Suggests the significance of green leaves to all life forms. The leaf as a food factory. Animated drawings show the relationship of leaves to roots, stems and flowers.

4. Flowers at Work—Physiology of flowers by time-lapse and microphotography. Methods of pollination, cross - fertilization, modification by cultivation.

5. Seed Dispersal—Methods of seed scattering; by wind, animals, forceful propulsion from seed case. Stop-motion photography of escape from seed case and struggle for survival.

6. Fungus Plants—Life cycle of mushrooms, molds, and other fungi. Economic importance as food and destroyers of dead organic matter.

7. The Dodder—Life story of a parasitic flowering plant. Its growth and effect on host plants shown by animation and stop-motion photography.

8. Plant Traps—The pitcher plant and sundew shown through their life cycles. Time-lapse photography of carnivorous activities.

Animal Life

1. The Frog—Life cycle of a representative amphibian from embryo to adult. Slow-motion, stop-motion, and microscopic photography.

2. How Nature Protects Animals—Examples of natural protection through fleetness of foot, mimicry, protective coloration, armor, and secluded homes, through insect and mammalian examples.

3. Beach and Sea Animals—Physical structure and activities of starfish, sea-urchin, crab, octopus, scallop and sea cucumber. Illustrations of balance in nature.

4. Tiny Water Animals—Life processes and activities of amoebae and paramecia, including reproduction; microphotography of other interesting animalcules.

5. Butterflies—Life history and nature's control of cabbage butterfly, swallow-tail butterfly, their role in cross-fertilization of flowers.

6. Moths — Life histories of silk moth and white masked tussock moth. Cocoon construction, economic importance.

7. Beetles—The ladybird beetle, the tiger beetle, and the Japanese beetle; their life history and economic relation to man.

8. Pond Insects—Interesting episodes from the life cycles of the diving water beetle, the dragonfly, and the mayfly.

9. Aphids — Their life cycle, unusual parentage, domestication by ants, and economic importance.

10. The Housefly —Complete story of this common but extremely dangerous pest; its activities as a carrier of disease, and methods of control.

11. Spiders—Complete life cycle of nursery-web, orb-web, funnel-web, and trap-door spiders. Interesting story of peculiar habits.

12. Birds of Prey—Various vultures, hawks, the bald eagle, and various owls in natural habitats; characteristic activities and sounds.

13. Thrushes and Relatives—Habitats, feeding habits, brooding, development and activities of the Bush-tit, Chickadee, Hermit-Thrush, Russet-backed Thrush, Robin, Bluebird, and Water Ouzel.

14. Animal Life—Main type of animals and animal functions from sponges to mammals. Locomotion, food intake, digestion, respiration, and nervous activity.

15. Reactions in Plants and Animals—Study of stimulus and reaction in different types of plants and animals. Tropisms and higher reactions.

Human Biology

1. Mechanisms of Breathing—Operation and control of the breathing mechanisms, including pathological conditions. Factors affecting rate and depth of breathing.

2. The Heart and Circulation—Mechanics of the pulmonary and systemic systems. Heart action with sounds. Capillary action; blood pressure.

3. Body Defenses Against Disease—Microscopic examination of the three lines of defense—skin, lymphatics, and the blood. Phagocytosis and antibodies.

4. The Nervous System—Depiction of the nervous system; nerve impulses and their pathways and connections. Nature of nerve impulses.

5. Reproduction Among Mammals—The story of embryology illustrated in the domestic pig. Fertilization, cleavage, blastulation, and subsequent developments ending with birth.

6. The Alimentary Tract—Treats in detail motility phenomena of the gastro-intestinal tract. Apparatus used in studying the motility of the tract is demonstrated.

7. Heredity—Animated drawings explain the processes of mitosis and meiosis in relation to the genes. Chance combination, genotypes and phenotypes are explained.

8. Digestion of Foods—Shows both the mechanical and chemical aspects of digestion, including mastication, swallowing, stomach contractions, intestinal segmentation and peristalsis, production of saliva and gastric juice, and the action of ptyalin on starch, of pepsin on albumin, and of lipase on fats.

PHYSICAL SCIENCE SERIES

Astronomy

1. The Earth in Motion—The dynamic aspects of the earth as a planet. Proof of sphericity, rotation, and revolution.

2. The Solar Family—The real and apparent motion of the planets. Motion of the solar system in space.

3. The Moon—The tides and phases of the moon. The moon's orbit, the lunar month, lunar and solar eclipses, the moon's path in space.

4. Exploring the Universe — The dynamic aspects of the stars within our galaxy and of the galaxies themselves. Apparent star motion, galactic rotation.

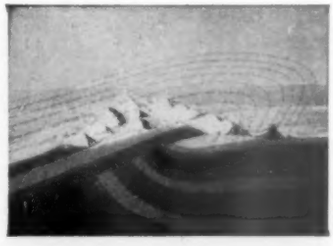
Geology

1. The Work of Rivers—The erosion cycle of water on the earth's surface. Falls, deltas, meanders, lakes, rejuvenation.

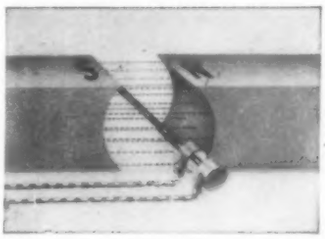
2. Ground Water—Artesian wells, springs, water tables, caves and wells. Geysers, petrifaction and concentration.

3. The Work of the Atmosphere—Temperature variations and erosion. The work of the wind in moving sand, loess, dust; formation of soil.

4. Geological Work of Ice—Types of glaciers and topographical results of glacial activities; the great ice ages; other gradational work of ice.



5. Mountain Building —The story of moun-



tain building and land subsidence; significance of these phenomena to mining and structural engineering.

6. Volcanoes in Action—Causes and distribution of volcanoes throughout the world. Present and past volcanic action; dykes, sills, and other products of volcanism.

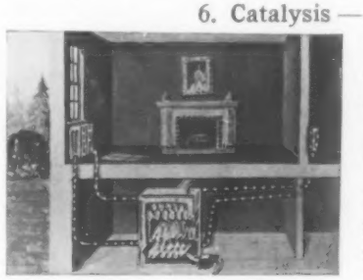
7. The Earth's Rocky Crust—Introduction to elementary geology; new land formation through volcanism and gradation.

8. The Wearing Away of the Land—How the land is affected by chemical decomposition of rocks, glaciers, wind and waves. Upbuilding of land.

9. The Work of Running Water—Many picturesque results of erosion. Stream deposits, deltas, and flood plains.

Physics

1. Energy and Its Transformations — Potential, kinetic and radiant energy as manifested in mechanical, chemical, and thermal forms. Concepts of "power" and "work."



2. Electrostatics — Relation of static electricity to modern theories of electricity; electrification; electroscope, and Compton electrometer.

3. Electrodynamics — Fundamental processes of current electricity and electromagnetism. Historical experiments, magnetic hypothesis, generators, induction, transformers.

4. Electrons — Development of the hypothesis that electricity consists of unit elementary charges, by observation of phenomena of conduction.

5. Sound Waves and Their Sources—Characteristics of sound waves such as frequency, amplitude, wave length, fundamentals, and harmonics.

6. Fundamentals of Acoustics—Phenomena of hearing and modification of sound between source and hearer. Velocity, refraction, attenuation, reverberation, and focusing.

7. Light Waves and Their Uses — Processes of reflection and refraction. Interference and polarization, electromagnetic spectrum and quantum theory.

8. Fuels and Heat—Explains the role of carbon in fuels, the process of combustion, relation of heat to temperature, and the operation of steam and internal combustion engines.

9. Distributing Heat Energy—Deals with the different kinds of heat sources, how furnace fuels are burned, development of home heating, and the mechanics of heat transfer.

10. Thermodynamics — Presents in more advanced form heat phenomena, including molecular action, mechanics of the steam engine, steam turbine, automobile and Diesel engines, and the first and second laws of thermodynamics.

Chemistry

1. Oxidation and Reduction—These phenomena as simultaneous processes shown by experiments with phosphorus, iron, and mercury. Everyday examples.

2. Molecular Theory of Matter—Evidence of molecular activity in gases, liquids, and solids is presented in support of the molecular theory of matter; difficult experiments demonstrated.

3. Electrochemistry — Electrolytic decomposition of hydrogen chloride, electric current from reaction between chlorine and hydrogen at platinum electrodes. Electroplating, electro-refining and electrolysis.

4. Colloids—Portrayal of colloidal suspensions; liquid in gas, gas in liquid, solid in liquid, solid in gas, and liquid in liquid. Brownian movement, Cottrell process of smoke precipitation.

5. Velocity of Chemical Reactions—The rate of chemical reactions affected by nature of reacting substances, by their concentration and by temperature. Reversible reactions and chemical equilibrium.

6. Catalysis — Adsorption, intermediate compounds, chain reactions, breaking of reaction chains, poisoning of catalysts, and negative catalysts or inhibitors.

HUMAN GEOGRAPHY SERIES

1. Shelter—Effect of climate and availability of materials on shelter. How man has learned to change raw materials to adapt them to the construction of various types of shelter.

2. Animals in Modern Life—Uses to which animals are put in our modern civilization; to furnish food, clothing material and power. Picturesque world scenes.

3. Our Earth—A survey of its physical aspects in relation to activities of peoples. Oceans, harbors, rivers and lakes, valleys, plateaus and mountains.

4. Water Power—Development of water power from the small colonial mill to Niagara, Boulder Dam, and the Tennessee Valley. A world-wide survey of potential water power.

5. The Development of Transportation—Transportation developments within the United States during the past one hundred fifty years, in overcoming physical barriers.

6. Clothing — Typical sources of clothing among backward peoples. Mass production and its effect on world clothing habits.

7. A Backward Civilization: The Berbers of North Africa—Survey of the life among the Berbers; an isolated type of civilization. Handicrafts, agriculture, customs and superstitions.

8. Conservation of Natural Resources—Water power, forests, and farm lands. Wastes in lumbering and agriculture. Wind and water erosion and unwise farming; local and federal efforts to check these abuses.

9. The Wheat Farmer—Portrays the life of a wheat farmer and his family in a typical midwestern area and focuses attention on the importance of their products to our existence.

10. Canals of England—Depicts the origin, development and present status of canal boat traffic in England by means of a voyage through the Grand Union Canal.

11. New England Fishermen—Describes the home life and occupational experiences of Gloucester schooner men and Boston trawler fishermen, including a trip to the Grand Banks.

12. Shell-Fishing—Essential experiences of the oyster man, crabber, clam man, and lobster man on the eastern coast of the United States, including catching and marketing processes.

13. The Cattleman—Depicts the life and activities of a family and its hired helpers on a modern cattle ranch. Cowboy songs lend charm to the picture.

14. The Navajo Indians—Authentic essentials of Navajo Indian life which few white people know about. Home life, arts and crafts, and recreation are shown.

15. Land of Mexico—Tells a graphic story of the origin, history, and contemporary life of the people of rural Mexico, with emphasis on habits and customs.

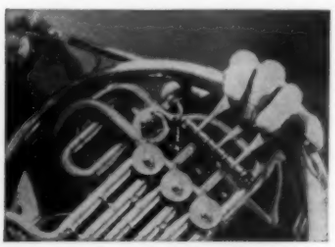
MUSIC SERIES

1. The Symphony Orchestra—The work of the conductor admirably caught by unique camera angles as he interprets brilliant scores through his orchestra of Philharmonic players.

2. The Percussion Group—Studies of the appearance, tone quality, and techniques of playing of the percussion instruments. Relation of percussions to symphony performance.

3. The String Choir—Functions of the stringed instruments in orchestral music. Bowing and pizzicato; finger techniques. Each instrument demonstrated in orchestral setting.

4. The Woodwind Choir—Displaying the woodwind instruments. Demonstrates individual tone qualities and gives pupils opportunity for studying playing techniques. Function of woodwinds in orchestra music.



5. The Brass Choir—Study of playing techniques among members of the brass choir and its contribution to symphony music. Demonstrations in full orchestral setting.

ART SERIES

1. Arts and Crafts of Mexico—Shows Mexican home craftsmen spinning and weaving wool threads into serapes or coat-like blankets. Also provides studies in Mexican basketry, glass-blowing, pottery-making and decorating.

PRIMARY GRADE SERIES

1. Animals of the Zoo—A study not only of the animals themselves, but the different kinds of food they eat, mainly in the conditions of their native homes.

2. Adventures of Bunny Rabbit—Characteristics and habits of rabbits in their natural environments in a dramatic, informational film. Bunny's adventures with various farm animals.

3. Farm Animals—Care and activities of farm animals; natural sounds. Feeding and milking, typical activities of farm animals, old and young.

4. Poultry on the Farm—The appearance and habits of adult and young chickens, ducks, geese and turkeys, in natural farm setting. Authentic sound.

5. Three Little Kittens—Shows in a captivating manner the life of a family of kittens on the farm, including their feeding, sleeping and playing activities.

6. Robin Redbreast—Tells a dramatic story of a robin family from the time mother and father robin build their nest until the baby robins are old enough to take care of themselves.

7. Mexican Children—Shows the Mexican child's home life, his preparation for citizenship, his recreation, his style of clothing, and his local travels and explorations.

8. Navajo Children—Relates the experiences of a Navajo boy and girl in moving with their family, household effects, pets, horses, sheep and goats from their winter quarters to their summer home, with Navajo conversation and songs.

9. Gray Squirrel—Brings to the classroom the life story of Mrs. Gray Squirrel and her babies over a six month period, including the outwitting of a hungry fox in search of his dinner.

10. An Airplane Trip—The journey of a mother and her daughter in a modern airliner from Los Angeles to Salt Lake City. Explains parts of the plane and its operation, as well as the services offered. Typical land forms observed.

11. A Boat Trip—The experiences of a boy and girl journeying from Albany down the Hudson River to see the wonders of New York Harbor. Many types of boats shown.

TRACK AND FIELD ATHLETIC SERIES

1. Dashes, Hurdles and Relays—Demonstrates in both normal speed and slow motion the techniques of running the 100, 200, and 400 meter dashes, along with hurdling and passing the baton in the relays.

2. Distance Races—Demonstrates by different cinematographic techniques the forms of running races from 1,000 to 10,000 meters, as well as the steeplechase.

3. Jumps and Pole Vault — Slow motion photography reveals the techniques and forms of the running high jump, running broad jump, hop, step and jump, and the pole vault.

4. Weight Events—Slow motion and normal speed studies of the shot put, discus throw, hammer throw, and javelin. In each of these events champions are shown in action.

CHILD PSYCHOLOGY SERIES

1. The Growth of Infant Behavior: Later Stages—Increasing ability of the growing infant to use his hands. Definite and predictable stages. Growth of the prenatal hand.

2. Posture and Locomotion—Steps by which the infant advances from a helpless state to the stage where he is able to change position and posture at will by various methods.

3. From Creeping to Walking—Mechanics of locomotion and stages by which the infant gradually attains a walking upright posture. The correlation of abilities is illustrated.

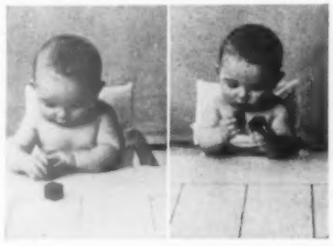
4. The Study of Infant Behavior—Clinical and research activities of the Yale Clinic of Child Development. Systematic photographic records of the reactions of infants.

5. The Growth of Infant Behavior: Early Stages—Rapid growth of behavior patterns in early infancy. Reactions of the self-same infant at different ages in comparison.

6. Behavior Patterns at One Year—Behavior patterns of a normal infant fifty-two weeks of age. The baby's reactions to cubes; other test situations.

7. Learning and Growth—Principles which govern the learning process. The possibilities and limitations of training infants from twenty-four to forty-eight weeks of age.

8. Early Social Behavior—Manifestations of infant personality. Ten different children from eight weeks to seven years of age are depicted; individual differences.



9. A Baby's Day at Twelve Weeks — His domestic day, from the time of waking at six o'clock in the morning until ten o'clock at night.

10. A Thirty-six Weeks' Behavior Day—Boy whose behavior day at 12 weeks was charted has made striking progress. His reactions are compared with those at twenty-four weeks.

11. A Behavior Day at Forty-Eight Weeks—Child care, including the bath, dressing, feeding, elimination, floor play and daytime naps and sleep.

12. Stages of Child Growth—Dr. Bühler demonstrates tests for measuring sensory acuity, reactions to social stimuli and powers of imitation in children of preschool age.

13. A Few Tests of Child Intelligence—Techniques employed by good psychologists. It is of interest and value to both parents and educators.

VOCATIONAL GUIDANCE SERIES

1. The Builders — A cross section of the building trades, centered around the construction of a huge skyscraper; shows specialized artisans at work.

2. Choosing Your Vocation—Dr. Kitson interprets vocational problems of a high school boy, as he goes through essential stages to a successful solution.

ERPI CLASSROOM FILMS INC. IS AN INSTITUTION DEVOTED EXCLUSIVELY TO THE SERVICE OF EDUCATION. FOR THE NEW CATALOG "INSTRUCTIONAL SOUND FILMS" — WHICH DESCRIBES THESE FILMS IN GREATER DETAIL — WRITE TO

Erpi Classroom Films Inc.

35-11 Thirty-fifth Avenue, Long Island City, N. Y.

GENERAL ELECTRIC COMPANY

1 River Road, Schenectady, New York

MOTION PICTURES

General Electric motion pictures are loaned to educational institutions, churches, social, civic and business clubs in the interest of educational commercial development and public welfare. Write for Bulletin GES-402-E which contains a brief description of the subjects listed, the nearest point from which the exhibitor may procure films, and other general information.

CLASSIFIED INDEX OF SUBJECTS

TRANSPORTATION

The Electric Ship
Conquest of the Cascades
The Broken Barrier
The Trolley Coach in Operation
The Zephyr
Trolley Coach Popularity
Trackless Electric Transportation
King of the Rails
Queen of the Waves
The Panama Canal
Illinois Central Locomotive
Modern Electric Transit
Diesel Electric Switchers
Moving the Millions Electrically

SCIENCE

Oil Films on Water
Radio-active Rays
Hottest Flame in the World
Constitutions and Transformations of the Elements
Arrangement of Atoms and Molecules in Crystals
Theory of the Transformer
Liquid Air
Cathode-ray Tube
Early Experiments of Michael Faraday
Magic vs. Science
"Perpetual" Light
Beyond the Microscope
Excursions in Science and Engineering No. 1
Excursions in Science and Engineering No. 2

GENERATION AND DISTRIBUTION OF ELECTRICITY

Steam Turbines
Modern Trend in Turbine Design
The Volt Comes into Its Own
Power Transformers
Induction Voltage Regulator
Hydroelectric Power
Installing a Primary Network Equipment
Oil-filled Cable
There's a Difference

ELECTRIC EQUIPMENT

Unseen Values in G-E A-c Motors
Service to Industry
Unseen Values in G-E D-c Motors
Quality Motors in the Making
Modern Switchgear for General Industrial Use
Why We Do It the Way We Do
The Busybody
Mountains of Copper
Oil Blast Explosion Chamber
A Modern Zeus
Big Deeds
Electric Heat in Industry
Enameling by Electric Heat
How the G-E Icing Unit Works
When You Can Measure

INDUSTRY

The Potter's Wheel
Cuba, The Island of Sugar
The Land of Cotton
The Sugar Trail
A Woolen Yarn
Conquest of the Forest
The Conductor
Our Daily Bread
Wizardry of Wireless
The World of Paper
Anthracite
Bituminous
Pillars of Salt

LIGHT AND LIGHTING

Brighter Times Ahead
Mazda Lamps Preferred
Highlights of the Science of Seeing
Light for Living
The Light of a Race
Mazda Lamp Manufacturing
The Cat and the Kit

WELDING

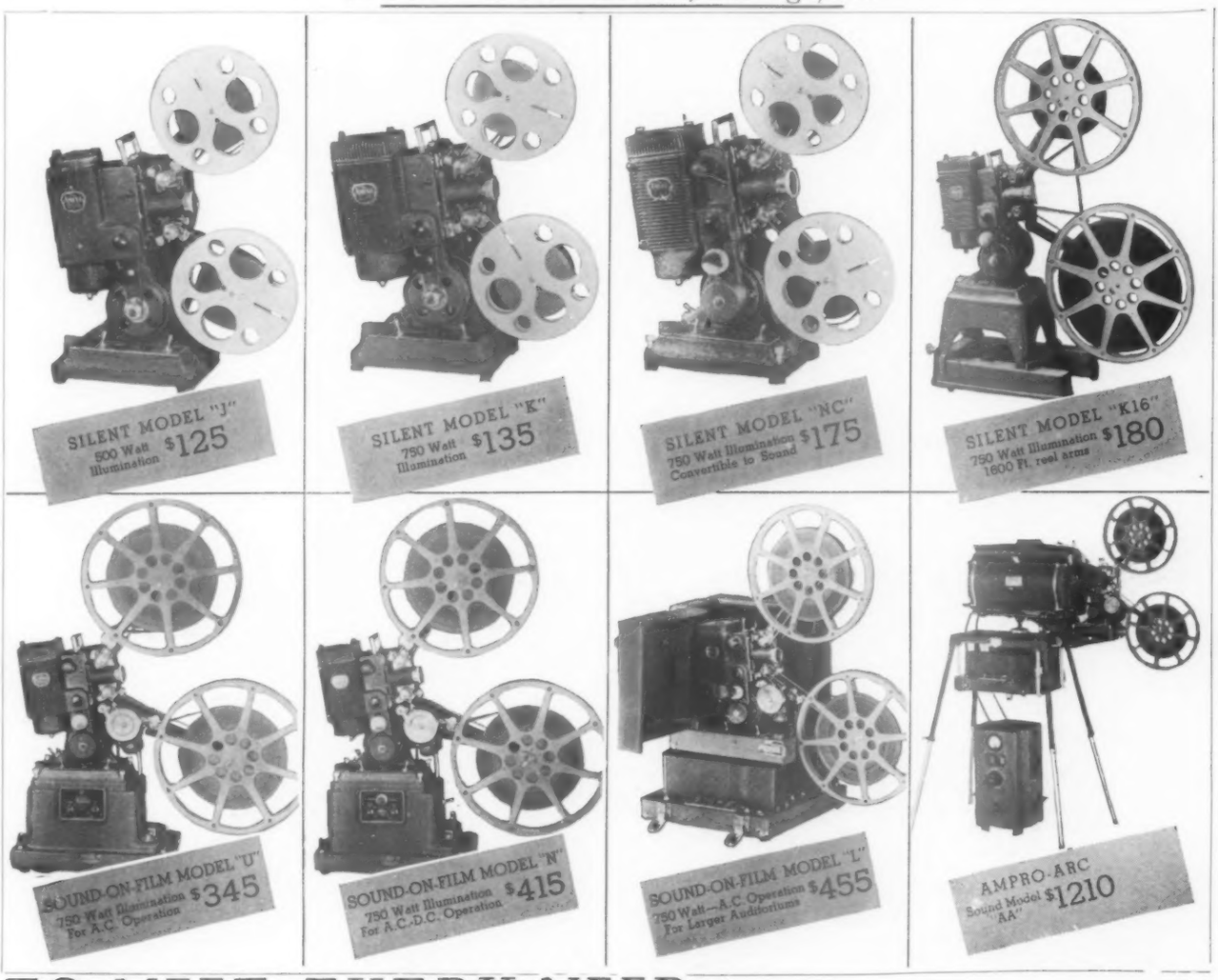
The Electric Needle
Ties of Steel
Automatic Arc Welding
Welding Battered Rail Ends
Arc Welding in Business Erection

MISCELLANEOUS

Walter Damrosch
Mica Insulation by Machine Methods
Life of Thomas A. Edison
Service to Agriculture
General Electric at the World's Fair
Just Around the Corner
The Benefactor
Thomas A. Edison
The Yoke of the Past
From Now On
The Molder
Something New Under the Sun
Three Women
Bill Howard, R. F. D.

AMPRO CORPORATION

2839 N. Western Avenue, Chicago, Ill.


SILENT MODEL "J"
500 Watt Illumination $125
SILENT MODEL "K"
750 Watt Illumination $135
SILENT MODEL "NC"
750 Watt Illumination Convertible to Sound $175
SILENT MODEL "K16"
750 Watt Illumination 1600 Ft. reel arms $180
SOUND-ON-FILM MODEL "U"
750 Watt Illumination For A.C. Operation $345
SOUND-ON-FILM MODEL "N"
750 Watt Illumination For A.C.-D.C. Operation $415
SOUND-ON-FILM MODEL "L"
750 Watt—A.C. Operation For Larger Auditoriums $455
AMPRO-ARC
Sound Model "AA" $1210

TO MEET *EVERY* NEED

. . . a wide range of Ampro 16 mm. projectors

IN THOUSANDS of schools, universities, clubs, churches and homes—Ampro precision workmanship and excellence of design has established Ampro as the standard of quality in both 16 mm. silent and sound projection. Today—Ampro projectors are approved and used by large metropolitan school systems who have made rigorous comparative tests. No matter what your requirements are, there is an Ampro model that best meets your needs. Send in today for your copy of the new 1939 Ampro Catalog giving full particulars.

NEW LOW PRICED AMPROSOUND MODELS

$275.00

Model "X"

Equipped with 60 cycle A.C. motor, including 1600 foot reel, 8" dynamic speaker, complete accessories and cords, comes in one case all weighing only 49 lbs.

Ampro announces two radically new and improved low-priced 16 mm. sound-on-film projectors that open unlimited possibilities for the increased use of sound films. They offer BRILLIANT 750-1000 WATT ILLUMINATION, SUPERIOR SOUND QUALITY, CENTRALIZED ILLUMINATED CONTROL PANEL and SIMPLIFIED THREADING.

$295.00

Model "Y"

Equipped with Universal A.C.-D.C. motor for both silent and sound film speeds, including complete accessories and cords, with 12" dynamic speaker, comes in 2 compact cases.

(Model "Y" also is available in one case, complete accessories, with 8" speaker.)

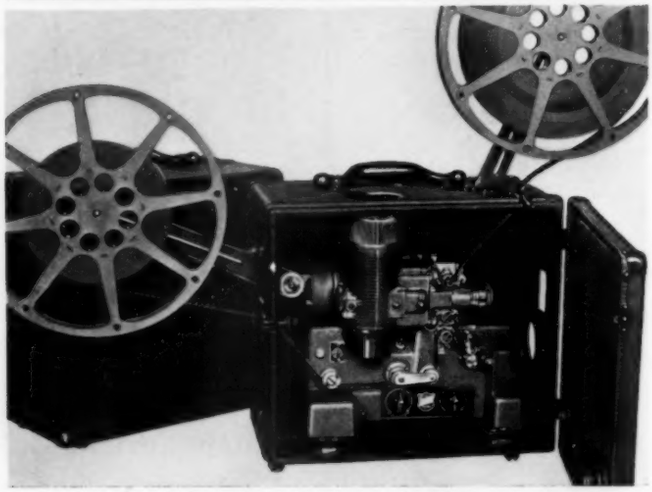
BELL & HOWELL COMPANY

1850 Larchmont Avenue, Chicago

New York — Hollywood — London

Manufacturers of FILMO *and* FILMOSOUND
Educational, Professional, and Personal Motion Picture Equipment

PROJECTORS DESIGNED ESPECIALLY FOR SCHOOL USE

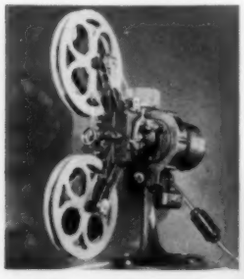


New "Academy" Filmosound 138

After studying school needs, Bell & Howell engineers built the new "Academy." Simplified for low cost and simple operation, it contains all the features most schools want. Projects both sound and silent films in classroom or moderate-sized auditorium. Has "blimp" case for quiet operation, speaker-hiss eliminator, "floating film" protection, 750-watt lamp, and three-quarter-hour 16 mm. film capacity. Easily portable in two light cases, it is compact, convenient.

The New Filmoarc

In the very largest school auditorium, the new Filmoarc provides the ultimate in screen brilliance and sound volume. Yet this most powerful of 16 mm. projectors is amazingly simple to operate, due to automatic carbon feed, centralized controls, foolproof connections, and other time-tested Filmo features.

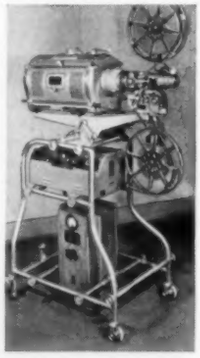


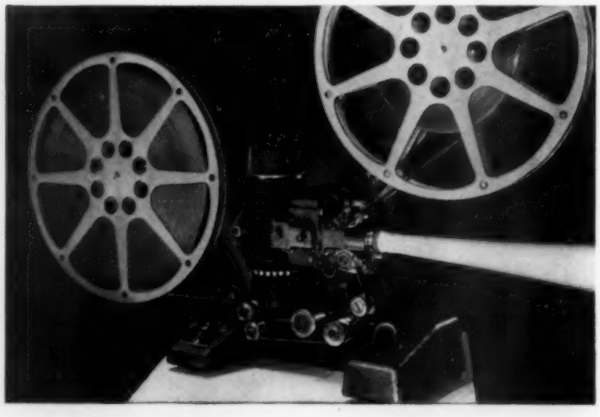
Silent Filmo 129

For brilliant pictures and uninterrupted hour-long silent film programs in classroom or moderate-sized auditoriums, Filmo 129 gets the call. Has 1600-foot film capacity, 750-watt lamp, F 2.1 lens, fast power rewind, provision for reverse and still projection, and many other features.

Classroom Filmo S

Ideal for 16 mm. silent movies in the classroom, Filmo S has 500-watt illumination, 400-foot film capacity, power rewind, lamp switch, reverse, clutch for still projection, interchangeable F 2.1 lens, and carrying case. Priced with the lowest.





CRAFTSMANSHIP

Designed especially for school use by the same engineers who create the preferred studio equipment of Hollywood, Bell & Howell 16 mm. Projectors embody the same precision and lifetime materials to assure lasting, satisfactory service.

SIMPLICITY

Bell & Howell Projectors are simple to operate. In hundreds of schools, students are operating this equipment after a few minutes of explanation. Easy accessibility and plain labeling of controls assure perfect presentations even by inexperienced operators.

RESULTS

Brilliant, rock-steady pictures—easy on the eyes—and full-range, faithful tone qualities are provided by Bell & Howell Projectors. Even under adverse circumstances, projection is of such theater-like quality that students forget the environment and become completely absorbed in the screen story.

FILM SAFETY

New safeguards offer film protection. No scratching. No tearing — film always travels in a straight line without twists.

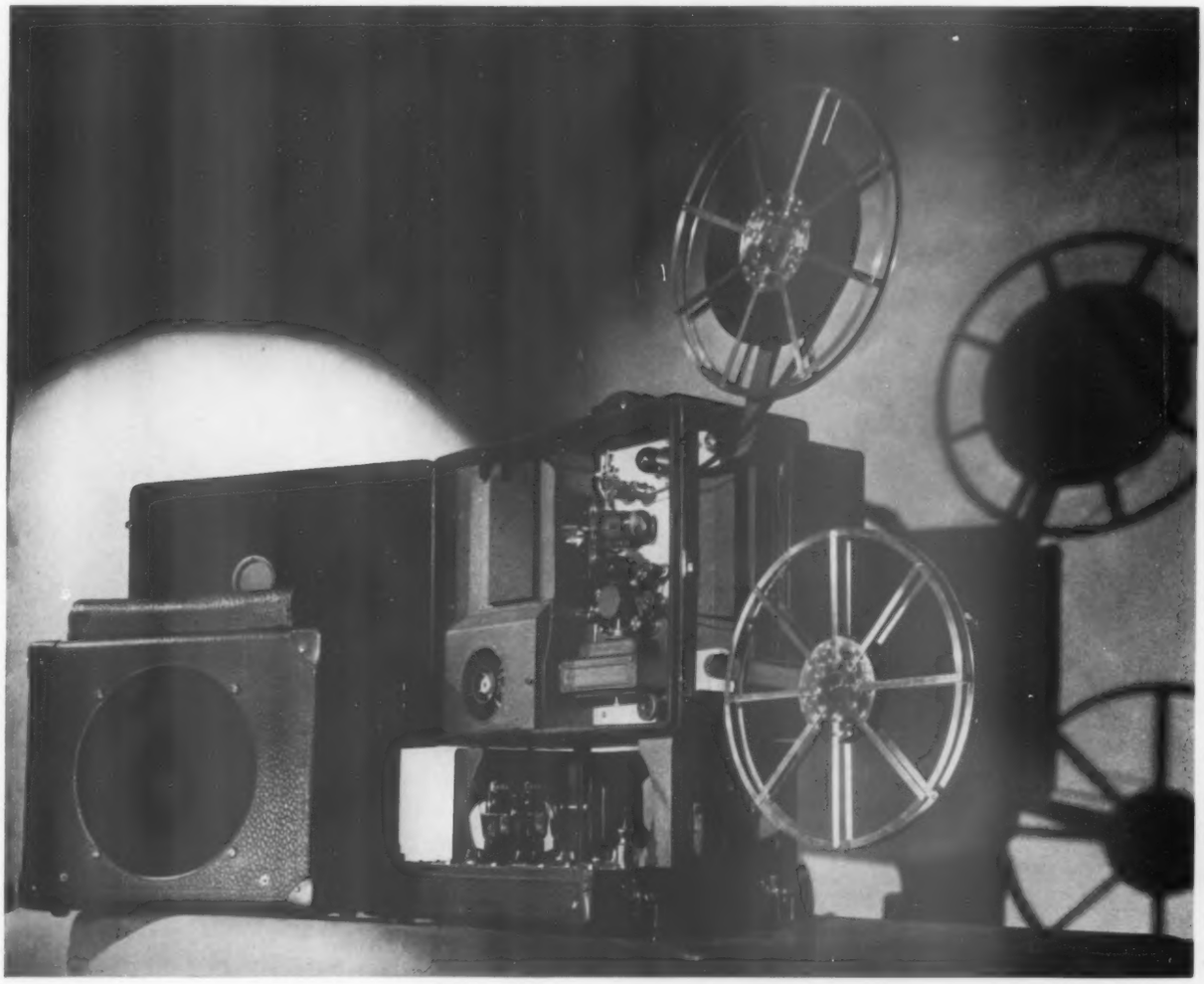
TERMS AVAILABLE

When your school purchases Bell & Howell Projectors, you will quickly realize the sagacity in paying, perhaps, a slightly additional first cost. Spread over the **added** years of serviceable life, the total cost is remarkably low. Write for complete information on the full range of B & H Projectors (there are many more than shown here), purchase plans, and B & H Film Library of thousands of educational films available for your use.

DeVRY CORPORATION

MAIN PLANT AND GENERAL OFFICE

NEW YORK — 1111 Armitage Ave., Chicago, Ill. — HOLLYWOOD



PRECISION SOUND at a *NEW LOW PRICE*

MOST POPULAR PROJECTOR in the quality-built DeVry line, the New DeVry "INTERPRETER" brings within the reach of all schools rich, full-range sound; clearer, steadier projection; automatic sound synchronization; easy threading; longer lasting equipment; two equal-weight, easy-to-carry "suitcase" units; and many other advantages. Write today for illustrated literature giving full descriptions of the "Interpreter" and other models of the complete DeVry line. The DeVry line of motion picture equipment includes a full range from 35 MM. professional sound projectors and cameras, to the smaller 16 MM. projectors and cameras — both sound and silent. Write also for "Values of Audio-Visual Aids in Education" and for 1939 list of DeVry School Films. Free.

Send today for "Proceedings and Addresses of the Eighth Session of the National Conference on Visual Education." You will find this book invaluable for its up-to-date, complete, and authoritative reports on educational films and visual methods. 50¢ prepaid.

Also, New 64-page book, listing 1400 **Free Films for Schools.**

Contains names and addresses of sponsors and distributors, and specifies whether film is 16 or 35 mm., Sound or Silent—25¢.

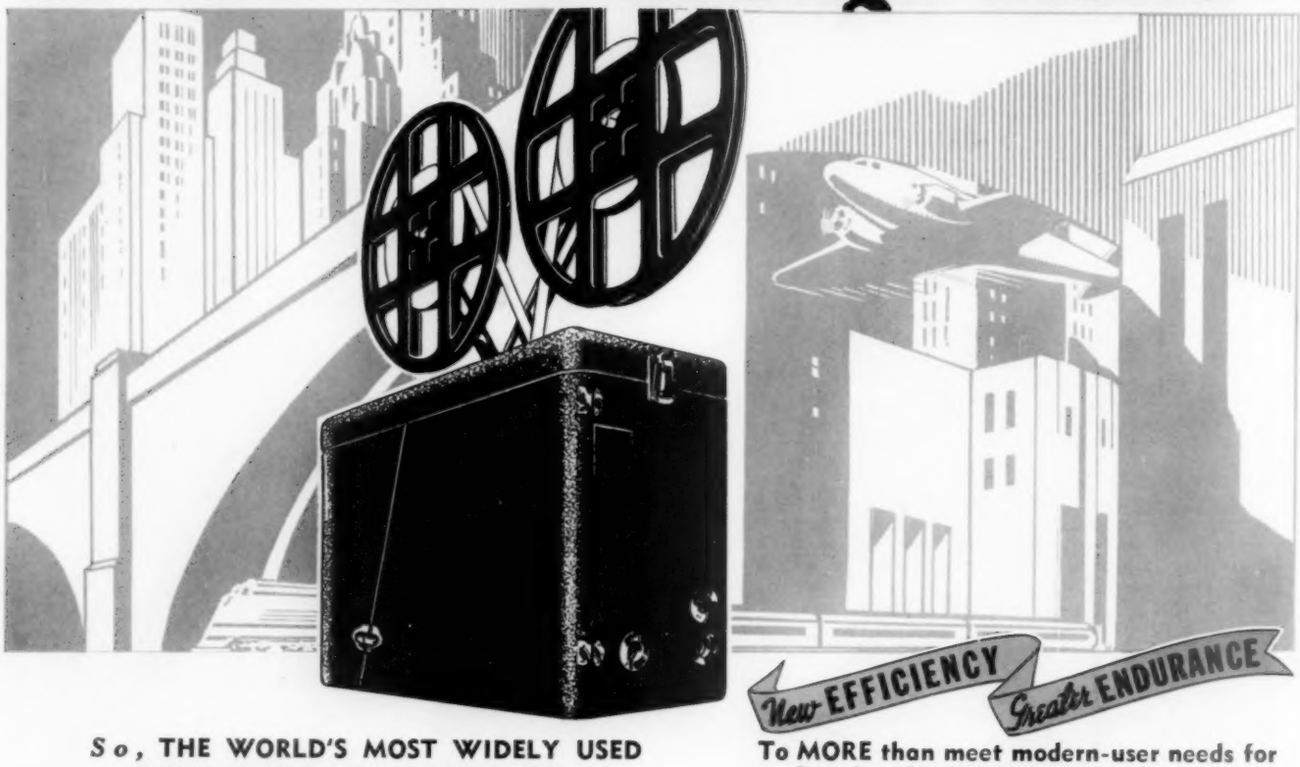
VICTOR ANIMATOGRAPH CORPORATION

Davenport, Iowa

Chicago Los Angeles New York

VICTOR REFUSED

to "Let well enough alone"



So, THE WORLD'S MOST WIDELY USED 16MM SOUND PROJECTOR GETS A *New, Super Endurance * Mechanism!*

ANIMATOPHONE Leadership dates from almost the very beginning of 16mm sound. Continuation of that leadership has been made secure, for LOOKING AHEAD, Victor has created for TODAY'S 16mm PROJECTOR USERS a Super-Endurance * Mechanism that anticipates the performance demands of the future!

Not only does this epoch-making advance in mechanism design provide definite assurance of UNPRECEDENTED PERFORMANCE, but it dwarfs service and parts-replacement problems to a mere nothing! A five year study of servicing records and user reports . . . on machines definitely known to have seen greater than average use . . . served as the guiding influence in the creation of this new Master *Mechanism.

** To be available in all models of Sound-on-Film Animatophone and VICTOR Silent Projectors.*

To MORE than meet modern-user needs for heavier duty projection equipment!

* * *

Just a few of the highlights of VICTOR'S NEW SUPER ENDURANCE MECHANISM:

FEWER MOVING PARTS . . . utter simplification . . . heavier, sturdier construction. "STRIP-PROOF" GEARS . . . full mesh . . . no engaging or disengaging during operation . . . reduced wear. LIFETIME BEARINGS that need NO OILING . . . made from amazing new alloy, will not change size, shape, nor score. Infallible TAKE-UP, regardless of reel size. 300 PERCENT STRONGER CAM-ASSEMBLY . . . heavier construction . . . newly perfected method of mounting. NO FLICKER—even at sub-normal speeds. INCREASED FLATNESS OF FIELD without loss of light. INCREASED SMOOTHNESS and CLARITY in sound reproduction due to improvements in Filter and Optics.

So . . . UP goes the efficiency curve and DOWN goes upkeep cost—if you choose the **new** ANIMATOPHONE . . . priced at $275 up! Demonstrations, without obligation, gladly arranged. *Write today!*

ANIMATOPHONE 16MM SOUND PROJECTORS

THE AMERICAN SCHOOL AND UNIVERSITY

BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt A/M, Germany

BDT BALOPTICON—For Slides Only

This extremely popular model is inexpensive, sturdy in construction, compact, easily portable and highly efficient. Its optical system is of exceptionally high quality and (depending on the lamp and lens used) can be used at distances from 4 to 80 feet from the screen. Image sizes range up to as large as 10 feet on the longer side. Maximum illumination. Extremely simple to operate. Still film, micro-projector and overhead projector attachments are available. The sturdy, tilting base is adjustable in two meridians and permits leveling the Balopticon even when placed on an uneven surface. This mounting allows for changing the projection angle for screen at various heights.

Model B is the same instrument as the BDT but without the tilting base. It is recommended for use where a permanent installation is being made, although it is readily portable.

ERM BALOPTICON —For Opaque Objects

Model ERM Balopticon is used to project opaque objects only. For that reason, economy is one of the major advantages of this projector. Photographs, pages or pictures from books, charts, drawings, actual objects such as botanical specimens are all excellent materials for this projector. Projects a 6″ square area of object but pages, charts, etc., up to 14″ can be accommodated. Specially designed parabolic reflector produces an unusually bright shadow-free image from a 500 watt lamp. Excels any projector with similar light source offered today.

Model LRM is arranged to project both opaque objects and lantern slides. This instrument allows you material available for both types of projection.

SEND FOR CATALOGS

Catalog E-11, "Balopticons and Accessories," completely describes our line of Balopticons, many of which were omitted here due to lack of space. Micro-Projectors for school and college use are the subjects for Catalog E-20. For information on Bausch & Lomb Microscopes and Spectrographs see page 495 of this book.

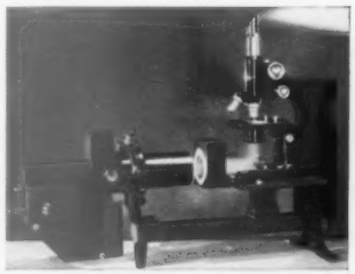
KOSB BALOPTICON —For Translucent Screen Projection

This projector is placed behind a translucent screen and the image is seen on the other side. It is especially designed for class room work for the teacher faces the class, standing by the screen and lecturing on the subject matter illustrated. So simple to operate that the teacher does not require an assistant. So powerful is the illumination that room can be left light enough for note taking. Projects opaque material up to 6″ x 6″ or a 6″ square section of a larger object. Projects standard size lantern slides. Strip film attachment available. Blower keeps interior of projector cool at all times. Easily portable.

OVERHEAD PROJECTOR ATTACHMENT —(For Use with Models B and BDT and KOSB)

This ingenious accessory permits the teacher to operate his own Balopticon and face his class. The image is thrown on a screen back of and over the head of the teacher. Teacher can point to objects on slide with pencil—image of pointer appears on the screen. A most efficient teaching aid and a great time-saver.

MODEL B MICRO-PROJECTOR



Now Bausch & Lomb offers a new Micro-Projector at a new low price. Any standard compound microscope can be used.

Simply place the microscope on the stage of the projector in an upright position, apply the prism reflector cap to the microscope and focus the illuminator. Complete directions accompany each projector.

Investigate this new instrument before completing your plans for science laboratory development.

TRIPLE-PURPOSE MICRO-PROJECTOR

Especially designed and priced for high schools, this extremely efficient unit serves three definite purposes—(1) projection of permanently mounted specimens on a screen from 4 to 15 feet away. (2) making drawings of microscopic fields. (3) projection of living specimens in liquids. Exceptionally sturdy in construction. Has both coarse and fine focusing adjustment. A two-power projection lens is included.

BALOPTICON TABLE

The B & L Balopticon Table provides a means of placing a Balopticon where it can be used to best advantage. It is portable (rollers on two front legs), and has a shelf underneath for slide boxes.

SPENCER LENS COMPANY

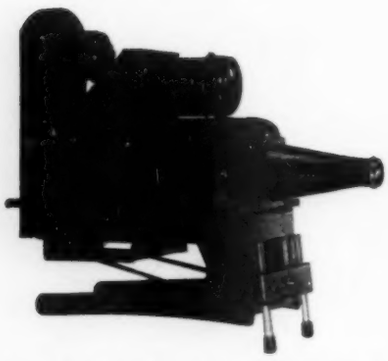
Buffalo, New York

Manufacturers of

Microscopes—Microtomes—Optical Measuring Instruments
Delineascopes—Photomicrographic Cameras

BRANCH OFFICES

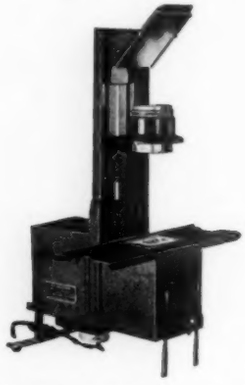
New York . . . Chicago . . . Washington . . . Boston. . . San Francisco . . . Los Angeles . . . Dallas . . . Columbus



COMBINATION CLASSROOM DELINEASCOPE

This Model VA Delineascope projects both lantern slides and opaque objects. It projects postcards, photographs, drawings, pages in books, mineral and biological specimens. The back of the instrument is open so that illustrations in books of large size may be projected. An improved elevating device facilitates centering the picture on the screen. Furnished with or without cooling fan. A filmslide attachment may be added.

Model V Delineascope is available for opaque projection only.



SCIENCE DELINEASCOPE

Spencer Model B is designed for lecture table use and projects glass slides, materials in Petrie Dishes or other transparent objects from a horizontal platform. Numerous scientific experiments such as magnetic lines of force, surface tension, mechanics, electrolysis, etc., can be effectively dramatized by projection to the entire class. This eliminates large, cumbersome and often expensive experiment set-ups.

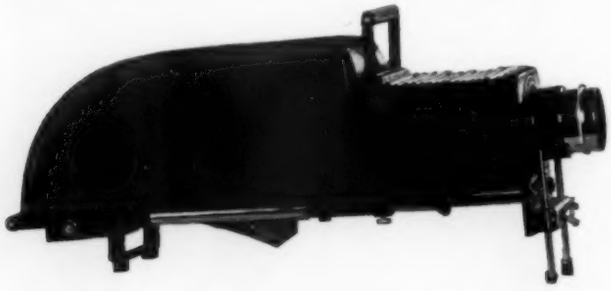
The action of drawing or writing with a pencil on a ground glass slide can be projected. The shadow of any small pointer may be projected on the screen which is above and behind the lecturer.

DELINEASCOPE

(For 2″ x 2″ Slides or 35 mm. Films)

Here is a low priced color slide projector of exceptional efficiency. Its Spencer optical system projects color slides with a brilliance and clarity heretofore possible only with larger and higher priced models.

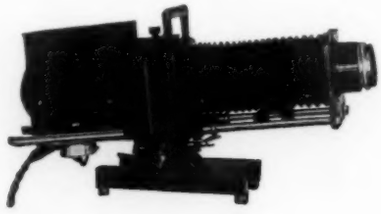
Film protection is assured. A large, well ventilated lamp house keeps the equipment cool enough to handle. Attachments for projecting roll film and for viewing strip film before making slides are available. It is sturdy in construction with accurately fitted parts.



NEW AUDITORIUM COLOR SLIDE DELINEASCOPE

Details and colors can now be brought to the projection screen in lifelike clarity and vividness with this new 750 watt Spencer Delineascope.

It accommodates both 2″ x 2″ and 3¼″ x 4″ slides and projects a more brilliant image either size than has formerly been obtainable with the average 1000 watt slide projector. An ingenious cooling system provides complete protection against film damage.



CLASSROOM DELINEASCOPE

Spencer Model D, for the projection of glass slides in classroom work, embodies several special features for the convenience of the teacher. It has a non-heat conducting carrying handle; a tilting and elevating device for conveniently locating the picture on the screen; an aperture in the side of the lamphouse to illuminate manuscripts; special optical system to insure remarkably sharp, brilliant pictures. Sturdy, lightweight and extremely portable.

WRITE DEPT. P13 FOR COMPLETE DETAILS ON SPENCER DELINEASCOPES

DA-LITE SCREEN CO., INC.

Manufacturers of Theatrical and Non-Professional Screens with All Types of Surfaces and Mountings

(Dept. 9ASU)

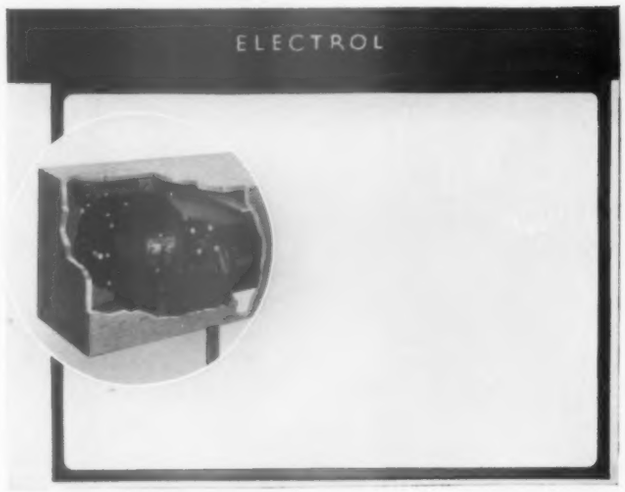
2723 NORTH CRAWFORD AVE., CHICAGO, ILLINOIS

HANGING SCREENS

The New Da-Lite ELECTROL

Is Electrically Operated

The new Da-Lite Electrol Screen can be operated by remote control from any part of the room. The screen cannot be lowered or raised beyond the proper position. Electrical control assures even rolling and movement at a constant speed. The Electrol can never fly up accidentally and become damaged in rewinding. It also can be stopped at any place desired. Square screens (for showing still pictures) can be adjusted to rectangular shapes for showing motion pictures. Available in any size up to 20′ x 20′. Special sizes supplied upon request. Write for descriptive literature and name of nearest dealer.



DA-LITE Glass-Beaded PORTABLE SCREENS

Reg. U. S. Pat. Off.

Models B & C, Spring-Operated

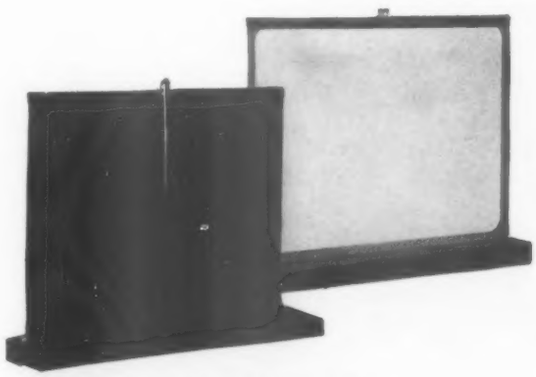
Da-Lite Hanging Screens are also available mounted on sturdy spring rollers for hand operation. Model B Screens have a metal case and are available in 12 sizes from 22″ x 30″ to 63″ x 84″. Model C Screens are mounted on a back board and are supplied with or without cover in 8 sizes from 6′ x 8′ to 12′ x 12′.

THE CHALLENGER

This popular Model has many exclusive advanced features such as square tubing in the center rod of tripod and extension support to hold the screen rigid and in perfect alignment—handle mounted on sturdy band encircling case—and fully opened screen adjustable in height to meet any projection requirements. 12 sizes from 30″ x 40″ to 70″ x 94″.

MODEL D

The Da-Lite Glass-Beaded Screen is roller-mounted in a leatherette-covered box. A single telescoping rear support holds the screen in position for showing pictures. 10 sizes from 22″ x 30″ to 72″ x 96″.



Da-Lite Model D Screen

DA-LITE TRANSLUCENT SCREENS

They are made of Da-Lite Da-Tex—a washable silk screen fabric. Da-Lite translucent screens assure rear-projection pictures of remarkable clarity and definition. Sizes range from 15″ x 20″ to 36″ x 48″.

AMERICAN OPTICAL COMPANY

Southbridge, Mass.

EDUCATIONAL DEPARTMENT

READING INSTRUMENTS

The Ophthalmograph is a portable eye movement camera which furnishes the teacher with photographic records (graphs) of the students eyes — taken while the eyes are at work. It can be operated by anyone after brief instruction. The cost of each test is only a few cents.

The Metronoscope combines all underlying ideas in methods developed to condition left-to-right control of the eyes as well as methods of short exposure to increase the span of recognition . . . it rhythmically exposes each line of print in three portions.

Complete information concerning these aids to reading can be secured from any one of the American Optical Co. Branches in the following cities.

ALABAMA
Birmingham
Gadsden
Mobile
Montgomery
ARIZONA
Phoenix
Tucson
ARKANSAS
Fort Smith
Hot Springs
Little Rock
CALIFORNIA
Bakersfield
Fresno
Long Beach
Los Angeles
Oakland
Pasadena
Sacramento
San Diego
San Francisco
San Jose
Santa Barbara
Santa Cruz
Santa Rosa
Stockton
COLORADO
Colorado Springs
Denver
Grand Junction
Pueblo
CONNECTICUT
Bridgeport
Hartford
New Haven
Norwich
DELAWARE
Wilmington
DIST. COLUMBIA
Washington
FLORIDA
Jacksonville
Miami
Orlando
Pensacola
St. Petersburg
Tampa
W. Palm Beach
GEORGIA
Atlanta
Augusta
Macon
Savannah
IDAHO
Boise
ILLINOIS
Bloomington
Champaign
Chicago
Decatur
East St. Louis
Peoria
INDIANA
Evansville
Fort Wayne
Hammond
Indianapolis
South Bend
Terre Haute
IOWA
Burlington
Cedar Rapids
Davenport
Des Moines
Dubuque
Fort Dodge
Marshalltown
Mason City
Ottumwa
Sioux City
KANSAS
Hutchinson
Salina
Topeka
Wichita
KENTUCKY
Lexington
Louisville
Paducah
LOUISIANA
Alexandria
Baton Rouge
Monroe
New Orleans
Shreveport
MAINE
Augusta
Bangor
Lewiston
Portland
MARYLAND
Baltimore
MASSACHUSETTS
Boston
Brockton
Fall River
Fitchburg
Lynn
New Bedford
Pittsfield
Springfield
Worcester
MICHIGAN
Detroit
Grand Rapids
Saginaw
MINNESOTA
Minneapolis
St. Paul
MISSISSIPPI
Jackson
Meridian
Vicksburg
MISSOURI
Columbia
Jefferson City
Joplin
Kansas City
Springfield
St. Joseph
St. Louis
MONTANA
Butte
Great Falls
Missoula
NEBRASKA
Grand Island
Hastings
Lincoln
Omaha
Scottsbluff
NEW JERSEY
Atlantic City
Jersey City
Newark
NEW MEXICO
Albuquerque
NEW YORK
Albany
Binghamton
Bronx
Brooklyn
Buffalo
Glens Falls
Hempstead, L. I.
Ithaca
Newburgh
New York
Niagara Falls
Poughkeepsie
Schenectady
Syracuse
Troy
Utica
Watertown
NO. CAROLINA
Asheville
Charlotte
Greensboro
Raleigh
OHIO
Akron
Canton
Cincinnati
Cleveland
Columbus
Dayton
Elyria
Mansfield
Toledo
Youngstown
OKLAHOMA
Enid
Muskogee
Oklahoma City
Tulsa
OREGON
La Grande
Portland
PENNSYLVANIA
Allentown
Altoona
Erie
Harrisburg
Johnstown
Oil City
Philadelphia
Pittsburgh
RHODE ISLAND
Providence
SO. CAROLINA
Columbia
Greenville
Spartanburg
SO. DAKOTA
Mitchell
Sioux Falls
TENNESSEE
Chattanooga
Johnson City
Knoxville
Memphis
Nashville
TEXAS
Abilene
Amarillo
Corpus Christi
Dallas
El Paso
Fort Worth
Harlingen
Houston
Lubbock
Paris
Port Arthur
San Antonio
Texarkana
Tyler
Waco
Wichita Falls
UTAH
Ogden
VERMONT
Burlington
VIRGINIA
Bristol
Norfolk
Richmond
Roanoke
WASHINGTON
Seattle
Spokane
Tacoma
Wenatchee
Yakima
WEST VIRGINIA
Bluefield
Charleston
Clarksburg
Wheeling
WISCONSIN
Green Bay
Janesville
Madison
Milwaukee
Oshkosh
WYOMING
Cheyenne

RCA MANUFACTURING COMPANY, INC.

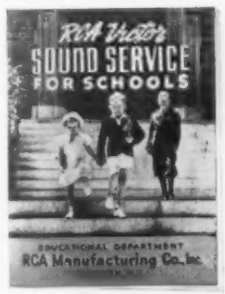
EDUCATIONAL DEPARTMENT
Camden, New Jersey
A Service of the Radio Corporation of America

ONLY RCA VICTOR OFFERS MODERN EDUCATORS A COMPLETE AUDIO-VISUAL SERVICE FOR USE IN SCHOOLS

Lessons that live are easy to learn! And RCA Victor's audio-visual teaching aids actually inject vibrant life into almost every subject you teach. As a result, students learn faster—and **remember** what you teach them.

RCA Victor alone offers you a complete sound educational service. Schools everywhere, both large and small, are invited to communicate with their nearest RCA Victor dealer, or the RCA Victor Educational Department at Camden, for details in connection with any or all of the following services:

1. Victor Records and radio recordings
2. RCA Victor music and reference books
3. RCA Victrolas and Victrola Attachments
4. RCA Victor radio receivers
5. RCA Victor voice and music recording equipment
6. RCA Victor School Sound Systems
7. RCA Victor portable public address systems
8. RCA test and laboratory equipment
9. RCA Sound Motion Picture Projectors
10. RCA radio transmitting equipment
11. RCA Victor Phone communicating systems
12. RCA Victor Microphones and Accessories
13. RCA Victor amateur receiving and transmitting equipment
14. RCA Victor radio tubes, RCA Radiotrons, Cunningham Radio Tubes



The new illustrated catalog, "RCA Victor Sound Service for Schools," describes many of the RCA Victor audio-visual educational aids. It also contains a wealth of helpful hints which show you how RCA Victor equipment may be used in your school most effectively. It is yours without cost. To obtain it write to RCA Victor Educational Department at Camden, N. J.

When you are considering new audio-visual equipment for your school it is suggested you consult the RCA Equipment Recommendation Service. This service is yours entirely without charge. We shall be glad to assist you in selecting the proper types of equipment for use in your school.

RCA VICTROLAS AND VICTOR RECORDS

Victrola Model U-123 is typical of the fine quality that is built into every instrument bearing the famous RCA Victor trade mark. Phonograph features include self-starting constant speed motor, excellent volume, 12″ electro-dynamic speaker, feather-touch crystal pick-up, top-loading needle socket. Radio features RCA Victor Electric Tuning, splendid reception of domestic programs.

RCA Victor offers you a complete collection of Victor Educational records. These include recordings for elementary grades, intermediate grades, high schools and colleges. They cover scores of subjects including children's songs, instrumental music for ear training, rhythm study, languages, dictation practice, music appreciation, and many others.

Just as they have discovered that Victor Records are invaluable in the classroom, modern schools have learned that for best results these records should be played on RCA Victrolas. RCA Victor offers a wide variety of such instruments in almost every price bracket. RCA Victrolas are available in table models and consoles—and bring you radio reception as well as record reproduction. In addition, RCA Victor offers inexpensive RCA Victrola Attachments which play Victor Records **through** the radio—and portable instruments for playing Victor Records exclusively. Remember—with an RCA Victor instrument you are assured of excellent tone and sufficient volume so that **all** may hear—the result of RCA Victor's unequalled experience.

You may secure this Catalog from your nearest RCA Victor Music Dealer, or by writing to the Educational Department in Camden. This catalog (list price 25¢) carries a complete listing of all Victor Educational Records except those for elementary schools. For the latter, ask for the Victor Record Catalog for Elementary Schools—free on request.

RCA VICTOR SCHOOL SOUND SYSTEMS

Educational authorities from coast to coast recognize the value of school sound systems as an essential part of the equipment of a modern educational institution—today this apparatus is almost a necessity. Its administrative uses alone are of untold value to the busy principal. In addition, RCA Victor School Sound Systems are used for announcements, instructions, class and drill signalling, and other similar purposes.

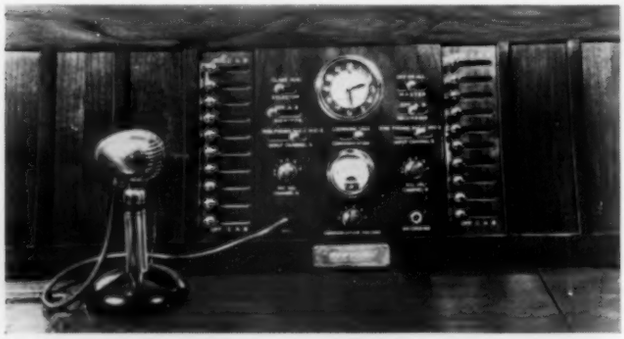
Pupils, however, receive the greatest benefits through enrichment of the curriculum. So varied are the uses of the RCA Victor School Sound system, Table Model MI-6718, that at the very touch of a hand the finest educational radio programs may be transmitted to any or all classrooms in the school.

And by merely pulling out the drawer which contains the modern RCA Victrola, you make available the world's finest recorded music, drama and speech to any or all classrooms—just as you wish.

The modern desk type console Model MI-6719 is a marvel of engineering, incorporating the latest features found in any school sound system. So flexible is this RCA Victor equipment that it may be used for as few as 10 or as many as 120 rooms. Provision is made for adding 10 rooms at a time—simply and quickly.

RCA Victor's two new school sound systems provide many splendid features. These features are definite proof that this equipment is your best buy. It will also be well to remember that behind this equipment is a company whose leadership in this field has been established by years of satisfaction to its customers—a company with a world-wide reputation for quality and value—a company whose experience with the transmission and reception of sound is unequalled —because only RCA Victor is engaged in **every** phase of radio and sound.

RCA Victor sound engineers, located in principal cities, will be glad to assist you in the selection and installation of a school sound system in your institution. Their advice is yours without charge or obligation.



Here's a close-up of front panel of RCA Victor School Sound System Model MI-6719. Location of controls on this panel assures simple operation, utmost convenience.

NEW LOW PRICED RCA VICTOR SCHOOL SOUND SYSTEM! This new equipment, Model MI-6718, is designed for small schools—both in size and price—and offers features that distinguish much more costly instruments. Built for schools with as few as 10 classrooms, this equipment is easily adaptable to as many as 40 classrooms, including sound amplification for the school auditorium. It has a 12-tube high fidelity RCA Victor electric and manual tuning radio and built-in Victrola with crystal pick-up. Housed in a beautiful walnut cabinet—only 42″ long, 18¾″ high and 14¾″ deep. Complete 2-way communication system. Speech, music, radio and recorded programs may be sent to any room or group of rooms, or to all rooms simultaneously.

A DE LUXE SOUND SYSTEM DESIGNED FOR 20 TO 120 ROOMS. This new RCA Victor equipment, Model MI-6719, in a new desk-type control console is ideal for almost any school. It contains two RCA Victor High Fidelity 12″ electric and manual tuning radios with foreign and domestic bands. Beneath the desk top, and accessible by merely sliding back the panel, is an RCA Victrola with Gentle Action Automatic Record playing mechanism for 10″ and 12″ records. Contains separate circuit for communication with any room without interfering with distribution of program to other rooms on same channel. Has high quality Electric Clock and Visual Volume Indicator besides many other fine features.

RCA VICTOR RECORDERS ... FOR VOICE AND MUSIC

Model MI-12700 RCA Victor Console Recorder

Model MI-12701 RCA Victor Portable Recorder

Teachers and school executives have found that the use of recording equipment provides them with the most accurate and scientific means of determining and correcting speech defects, and measuring pupils' progress in speech and music instruction. Consequently there is a definite trend to the use of recording equipment in forward-looking schools.

For a recording instrument to help you instruct students in the art of speech—to help you give them proper musical guidance—it is essential that it have these characteristics:

1. It must record and reproduce with absolute accuracy
2. It must be sturdily constructed to withstand hard usage
3. It must be completely dependable in operation
4. It must be exceedingly simple to operate

Because RCA Victor has for years been outstanding in the recording and reproducing industry, you are assured of these essentials when you have an RCA Victor Recorder. These instruments, sturdily built, bring you the very finest in recording and reproduction, the utmost dependability, and are so easy to operate that available personnel, without special technical training, can operate them.

At the left are illustrated RCA Victor's two newest recorders. Completely self-contained, they provide all the necessary elements for recording — microphone, motor and turntable assembly, recording head and amplifier—and a pick-up, tone arm and speaker for immediate play-back of the records you make. To operate, you simply plug them into an electric outlet as you would a lamp.

Console Model MI-12700 is extremely versatile. Records and reproduces records at speeds of 78 or 33⅓ r.p.m., inside out or outside in, using 10″, 12″ or 16″ records. Among the many features that provide recording ease and fidelity of reproduction are visual indicator meter, new cutting and recording head, aerodynamic microphone, high fidelity amplifier and speaker, volume and tone controls.

Model MI-12701 is a portable recorder which comes to you in an attractive gray carrying case. Records at speeds of 78 r.p.m. on 6″ to 12″ records. Uses outside in recording method. Comes complete with amplifier, microphone, visual indicator meter—is an exceptional value at its low price.

Either the turntable and tone arm or cutting and recording head of the MI-12700 are available as separate units to those schools which want this equipment for transcription use.

RCA VICTOR PORTABLE PUBLIC ADDRESS SYSTEMS

For auditorium, gymnasium, playground and athletic field use, RCA Victor Portable Public Address Systems are ideal. They amplify vocal and instrumental music, speech and recordings of all kinds so that students, no matter where they are situated, may hear what you want them to hear—clearly and distinctly. This equipment is built so that it may be used in conjunction with an RCA Victrola Attachment, making practical the use of Victor Records with large groups, in or out of doors.

Model PG-112-B illustrated at right is RCA Victor's newest. A 12-watt system, it comes with a velocity type microphone and two permanent field dynamic loud speakers. It is lighter than ever before. Amplifier may be used with one or two speakers, as you wish. Provides volume for auditorium seating as many as 2,000 persons.

Model PG-114 also illustrated at right provides 24 watt output—sufficient to meet the usual requirements in an auditorium seating 3,500 persons. Comes to you in two cases with one velocity microphone and microphone stand, and two permanent field dynamic loud speakers. With this instrument amplifier may be operated by remote control.

RCA Victor Portable Public Address System, PG-112-B

RCA Victor Portable Public Address System, PG-114

MORE RCA VICTOR EQUIPMENT FOR SCHOOL USE

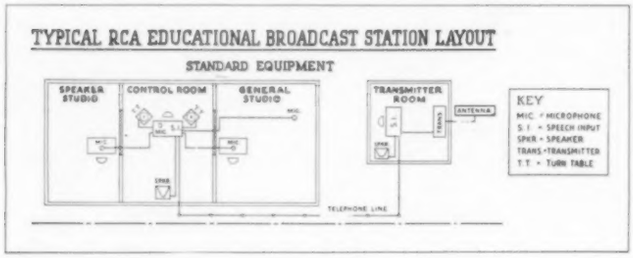
RCA Victor Radio Receivers

The use of radio in schools becomes more widespread all the time. Everywhere schools are utilizing the many fine educational programs put on the air by networks and local stations.

If your school is not equipped with a modern radio you are not giving your pupils the full benefit of these programs. A new 1939 RCA Victor radio is the answer to your problem. These instruments come in a wide variety of types — ranging from the extremely inexpensive table models to superb consoles that bring you the newest, finest features for outstanding performance. Many of these instruments are particularly effective for use in classrooms—others for use in your school auditorium.

Model 97KG illustrated here, typifies the quality you'll find in all RCA Victor radios. Has Electric Tuning for 6 stations, RCA Victor Metal Tubes, Victrola Button, "plug-in" for Victrola Attachment, Magic Eye, 4.5 watts output, and a tuning range which brings you domestic broadcasts and foreign programs on the 49, 31, 25, 19, 16 and 13 meter bands. Excellent for the small auditorium.

RCA Ultra-High Frequency Equipment

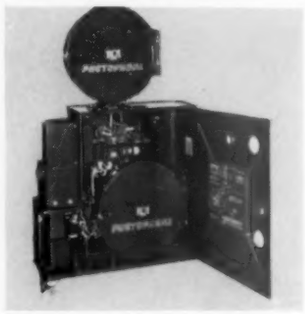


The Federal Communications Commission has set aside 25 channels in the 41,000 kilocycle broadcast band exclusively for educational use. Short-wave broadcasting by schools from a central school radio station to receivers located in all of the school buildings is a new, and probably the most progressive and far-reaching development in modern education.

In view of the great interest shown by schools in short wave broadcasting, RCA has made available Ultra-high frequency equipment for school use. This equipment incorporates the latest developments found in modern broadcasting equipment. It is designed and manufactured by the same engineers who have furnished the majority of the high-powered broadcasting stations throughout this country.

The diagram above shows a typical educational broadcast station layout. A complete system includes studio equipment, radio transmitter and radio receivers for the schools. Because special engineering advice is always necessary in connection with the designing of a complete broadcast station, this educational broadcast equipment is sold to individual schools by the Broadcast Transmitter Section of the RCA Manufacturing Company, Inc., in Camden. Full details on request.

RCA Sound Motion Picture Projectors



Add sight to sound in modern education—and you have an unbeatable combination for effective teaching! And that is precisely what you can do when you have an RCA Sound Motion Picture Projector in your school.

This equipment enables you to present educational films in a really "big time" manner — because it is designed by RCA Photophone engineers. And if you are a movie goer you know that the RCA Photophone Magic Voice of the Screen—the very same equipment we offer you for your school—is used by more than 5,000 enthusiastic theatre owners from Maine to California.

RCA Sound Motion Picture Projectors for your school are available in many sizes of portable and permanently installed equipment.

RCA Laboratory and Test Equipment

Illustrated here is the RCA 3" Cathode Ray Oscillograph—Stock No. 155. Net Price, $63.95

Schools which offer courses in radio, electrical engineering and related subjects find that their students do more accurate work when RCA laboratory and test equipment is used. This equipment includes a remarkable group of scientific apparatus designed by RCA engineers and universally used in the foremost radio and television research laboratories of the country, in addition to the leading school and college laboratories, physics classes, etc.

Space does not permit a complete listing of this RCA equipment, but some of the instruments available for your school—instruments considered the standard of excellence by the finest radio service organizations—are Cathode Ray Oscillographs, Test Oscillators, Beat Frequency Oscillators, Frequency Modulators and Universal AC bridges.

Just remember that whatever you need in the way of laboratory or test equipment, RCA has it—and gives you the very finest at low cost.

For full details about RCA's complete Sound Service for Schools write to the Educational Department of the RCA Manufacturing Company, Inc., at Camden, N. J. Be sure to ask for your free copy of the Booklet, "RCA Victor Sound Service for Schools."

Modern schools stay modern with RCA Tubes in their sound equipment.

RCA presents the Magic Key every Sunday, 2 to 3 P.M., E.S.T. on the NBC Blue Network.

GRAYBAR ELECTRIC COMPANY

Executive Offices: Graybar Building, Lexington Ave. and 43rd Street
New York, N. Y.

DISTRIBUTING HOUSES

Akron, Ohio
Albany, N. Y.
Allentown, Pa.
Asheville, N. C.
Atlanta, Ga.
Baltimore, Md.
Beaumont, Texas
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbia, S. C.
Columbus, Ohio
Dallas, Texas
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich.
Duluth, Minn.
Durham, N. C.
Elmhurst, L. I., N. Y.
Flint, Mich.
Ft. Worth, Texas
Fresno, Calif.
Grand Rapids, Mich.
Hammond, Ind.
Harrisburg, Pa.
Hartford, Conn.
Houston, Texas
Indianapolis, Ind.
Jacksonville, Fla.
Kansas City, Mo.
Knoxville, Tenn.
Los Angeles, Calif.
Louisville, Ky.
Memphis, Tenn.
Miami, Fla.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Newark, N. J.
Norfolk, Va.
Oakland, Calif.
Oklahoma City, Okla.
Omaha, Nebr.
Orlando, Fla.
Peoria, Ill.
Philadelphia, Pa.
Phoenix, Ariz.
Pittsburgh, Pa.
Portland, Ore.
Providence, R. I.
Reading, Pa.
Richmond, Va.
Roanoke, Va.
Rochester, N. Y.
Sacramento, Calif.
St. Louis, Mo.
St. Paul, Minn.
Salt Lake City, Utah
San Antonio, Texas
San Diego, Calif.
San Francisco, Calif.
Savannah, Ga.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Tacoma, Wash.
Tampa, Fla.
Toledo, Ohio
Washington, D. C.
Wichita, Kan.
Winston-Salem, N. C.
Worcester, Mass.
Youngstown, Ohio

PRODUCTS

The Graybar Electric Company, brings to meet any and every electrical need for schools and colleges, more than 60,000 electrical supplies—supplies whose dependability is warranted by Graybar's 70 year old quality reputation.

The 83 distributing houses listed above bring these supplies within arm's reach of demand everywhere, making instantly available everything electrical, to transmit, apply and control electricity in school and college buildings.

INTER-COMMUNICATION

School boards, superintendents, and architects can well appreciate the importance of an interior telephone system that knits all the individuals of the teaching staff together—without, at the same time, requiring the services of an operator. Graybar Inter-Phones are simple to operate. The user merely pushes a button to make a connection.

In addition, Graybar supplies many other types of electrical signalling equipment for schools, including bells, buzzers, annunciators, and gongs of every variety with all accessory equipment. Write us for more detailed information.

PROGRAM AND SOUND SYSTEMS

We can now supply complete school systems covering Telephone Communication, Fire Alarm, Program Clocks, Laboratory Switchboard and Panels, Complete Public Address or the Program Sound System which is a two channel type arranged to provide pick up from microphones, phonograph reproducers or an all way radio receiver on either channel and will provide two programs simultaneously. It is possible to select any one of the pick ups, amplify it and distribute the program to any one or all the speakers in the class rooms at the same time.

LIGHTING EQUIPMENT

A complete selection of fixtures, glassware and accessory products to meet the specialized needs of school and college buildings is quickly available through Graybar.

Lighting specialists from Graybar can help architects and school boards secure the most efficient installation. The Graybar Electric Company has given the problem of proper school lighting special study and has developed the most complete line of lighting fixtures and glassware suited to school and college needs.

LAMPS

Mazda Lamps are available on quick call at Graybar Electric Company distributing houses located in 83 principal cities throughout the country.

These well-known, extremely efficient lamps are stocked in the five standard sizes—25, 40, 60, 100 and 200 watts—adopted to simplify ordering.

WIRE AND WIRING SUPPLIES

Graybar Electric Company distributing houses carry large stocks of wiring supplies for power, light and inter-communication construction and maintenance. This includes wire, conduit, wiring devices, connectors, etc., for all purposes. All materials are of the highest quality, the products of long established, well-known manufacturers.

60,000 OTHER ITEMS

The above products cover only a very small portion of the 60,000 products distributed by Graybar. For complete information covering these or other electrical products for schools and colleges address the nearest Graybar office, or Graybar Electric Company, Lexington Ave. and 43rd St., New York, N. Y.

WESTERN ELECTRIC COMPANY

New York, N. Y.

Distributor in the United States
GRAYBAR ELECTRIC COMPANY
Graybar Building, New York, N. Y.
Distributor for Canada and Newfoundland
NORTHERN ELECTRIC COMPANY, LIMITED
1261 Shearer Street, Montreal, P. Q.

Western Electric
SOUND DISTRIBUTION SYSTEMS

General

Western Electric equipment picks up, amplifies and distributes speech or music to all parts of an auditorium—to any or all rooms in a building—or to a number of points out of doors. The source of the program may be (1) Microphones, (2) Record Reproducer, (3) Radio Receiver.

New equipment developed by Bell Telephone Laboratories for the Western Electric Company now provides for greater quality and flexibility of use than heretofore.

The 633A microphone is especially adaptable to school needs.

Many up-to-the-minute schools, colleges and universities in all parts of the country have found Western Electric sound distribution systems valuable—for both educational and administrative uses.

What goes into a Sound System?

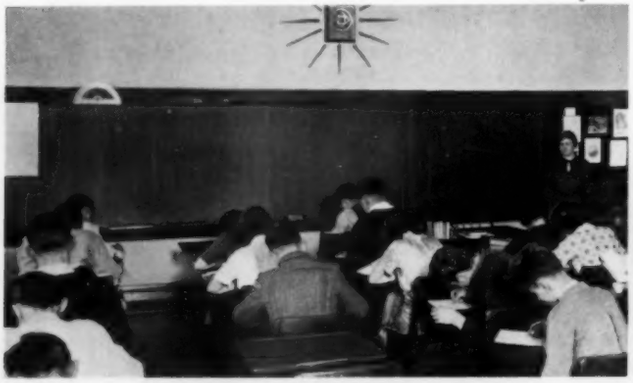
There's much more to a good sound distribution system than just electrical equipment. The following six factors must all be balanced with expert care. (1) Sound Origin—whether speech, or music, or both, (2) Sound Pick-up, (3) Amplifiers, (4) Loud Speakers, (5) The Room or Rooms — size, shape, acoustics, etc., (6) The Audience — whether large or small.

Because these factors vary so widely in different installations, each Western Electric sound system is skillfully engineered to meet the specific needs in each case.

Workmanship, Service and Cost

Quality workmanship and performance are assured by the name Western Electric—manufacturer of telephones and other sound-transmission apparatus for the Bell System since 1877.

Stocks of spare parts, engineering advice and expert service are always available through distributors located at strategic points throughout the country.



Farrell High School, in Farrell, Pa., is one of many users of Western Electric Sound Distribution Systems. Note loudspeaker above blackboard.

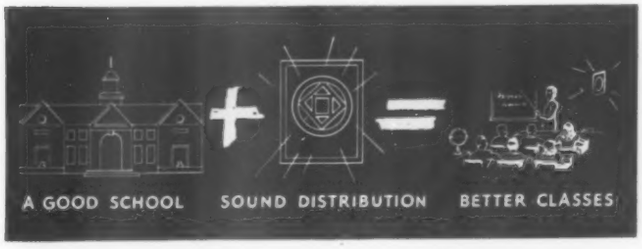
This attractive school at Millburn, New Jersey, is modern in every way. It has been Western Electric equipped for a number of years.

In estimating the cost of installation, specific requirements must be considered. Graybar Electric Company specialists—with years of experience in this work—will gladly survey your buildings, recommend a system for adequate coverage, furnish complete specifications and an estimate of cost.

Operating costs are surprisingly low—only a few cents an hour.

Uses in Schools

Sound distributing equipment is a valuable aid to teachers of languages, current events, music appreciation, home economics and other courses. It enables the principal to address all classrooms from his desk;



delivers fire drill instructions and emergency announcements instantly; supplies music or voice amplification in gymnasium or auditorium. Its usefulness extends throughout the school day.

For full information, write to the distributors listed at top of preceding page.

East Rockaway High School, on Long Island, finds many uses for its Western Electric equipment throughout the school day.

THE AMERICAN SCHOOL AND UNIVERSITY

WESTERN ELECTRIC AUDIOMETERS

Poor hearing is often the cause of poor classwork. With the Western Electric 4B Audiometer, pupils' hearing acuity may be measured quickly and accurately—as many as 40 at one time.

This scientific instrument consists of a turntable with magnetic reproducer—and from 10 to 40 headsets through which pupils listen. It plays records scientifically designed to show degree of hearing loss. Pupils write what they hear on data sheets. By checking these against a master sheet, even slight hearing defects are seen at a glance. Ask the distributors for booklet giving full details.

WESTERN ELECTRIC AUDIPHONES

For the hard-of-hearing, Western Electric offers the new Ortho-technic model Audiphone—built on

Air Conduction

Bone Conduction

entirely new principles in hearing aid design. Using either air conduction or bone conduction receivers, this new aid is assembled to meet individual needs.

There is also the Western Electric Group Audiphone. With this, the speaker's words are picked up by a microphone, amplified, and delivered through individual headsets. Further details from the distributors on the preceding page.

HEYWOOD-WAKEFIELD COMPANY

Gardner, Mass.

OFFICES IN: Baltimore Boston Chicago Los Angeles New York Philadelphia San Francisco

DISTRIBUTORS

Bromberg & Co., Birmingham, Ala.
H. Albert Neal & Co., Boise, Idaho
Henry S. Wolkins Co., Boston, Mass.
The General Co., Cincinnati, Ohio
Parsons-Souders, Clarksburg, W. Va.
Theatre Equip. and Service Co., Denver, Colo.
Bickley School and Church Furniture Co., Houston, Tex.
B. F. Shearer Co., Los Angeles, Calif.
Tappen & Katz, Mineola, L. I., N. Y.
Farnham Stationery and School Supply Co., Minneapolis, Minn.
H. C. Parker, Inc., New Orleans, La.
Oklahoma School Supply Co., Oklahoma City, Okla.
Hughes-Ogilvie Co., Pittsburgh, Pa.
B. F. Shearer Co., Portland, Ore.
Standard School Equipment Co., St. Louis, Mich.
A. A. Johnson, Salt Lake City, Utah
J. H. Persse & Co., Savannah, Ga.
B. F. Shearer Co., Seattle, Wash.
C. P. Sudweeks Co., Spokane, Wash.

CLASSROOM SEATING

AUDITORIUM SEATING

Movable Desks

The Movable Desks in the Heywood-Wakefield line comprise all of the accepted types in steel and all-wood constructions. These include the Unit Movable Desk, an adjustable style with single unit underconstruction; Movable Chair Desks with Floating Arm construction; Steel Standard Table Desk and Chair; Study, Typewriter Tops on Unit Movable and other standards; and a complete line of classroom and lecture hall chairs. Also available are Chromium frame, streamlined desk and chair designs. All wood table and chair sets are made in standard and modern designs.

Fixed Desks

The Stationary or Fixed Desks in the Heywood-Wakefield line have steel underconstruction and steel side desk boxes. Adjustable types have a wide range of sizes which accommodate pupils of all sizes and ages, from kindergarten through college. The Fixed Desks include: Eclipse Adjustable Desk; Sanitary Pedestal Desk with adjustable and non-adjustable pedestals, a style designed particularly to promote classroom cleanliness; Combination Desk which has been in popular use for more than thirty years; Typewriter, Lecture Hall, Study Chairs as well as Teachers' and Visitors' Chairs.

Auditorium Seating

In the Heywood-Wakefield line are all-plywood; inserted panel; and full upholstered chairs. A splendid variety of cast iron and all steel end standards are available. On full upholstered auditorium chairs, a special Streamline Edge may be used on the backs. This edge, formed from heavy, cold rolled steel protects the upholstery from soiling by students' hands and assures longer wear. Special types of chairs which fasten to the face of balcony risers are also available. A complete line of folding portable assembly seating rounds out the Heywood-Wakefield Auditorium line.

Gymnasium and Stadium Seating

Heywood-Wakefield has furnished seating for major league baseball parks, prominent sporting arenas, jockey clubs, etc. These same seats have been installed in school and college gymnasiums and on athletic fields all over the country.

If you are selecting school or college equipment for new or replacement use, may we offer practical, experienced assistance in helping you solve any problems that may arise? A note to any of the offices listed above will bring detailed information without cost or obligation. We shall also be pleased to send you our latest catalogues.

THE THEODOR KUNDTZ CO.

Center and Winslow Sts.
Cleveland, Ohio

Seating for Every School Requirement

STATIONARY DESKS
MOVABLE DESKS
ADJUSTABLE DESKS
STUDY TOP DESKS
TABLET ARM CHAIRS
AUDITORIUM CHAIRS

Model 641S

PORTABLE FOLDING CHAIRS
LIBRARY TABLES
LIBRARY CHAIRS
CAFETERIA TABLES
CAFETERIA CHAIRS
TEACHER'S DESK AND CHAIR

Featuring the SIGHT SAVER *Desk*

the desk embodying "Focal Adjustments"—the essential principles necessary to **Reduce Nearsightedness, Protect Normal Eyes** and **Induce Correct Posture.**

Principle No. 1. Adjustable Ball Bearing Swivel Seat.

Principle No. 2. Adjustable Desk Top as follows:

A. Height. For tall or short pupils.
B. Angle. Desk top lifts to any desired angle from the horizontal to the vertical plane, enabling books to be at the correct eye focus and permitting correct posture.
C. Distance. Desk top can be pushed backward or forward enabling material to be adjusted to individual differences.

Principle No. 3. Movable. Desk and seat are one unit, easily moved for best working plane illumination.

Principle No. 4. Tubular construction for rigid strength and durability.

Principle No. 5. Dull finish on wood and metal preventing injurious glare.

Write for descriptive charts and specification sheets

Model
No. 631

Also available as Tablet Armchair . . .

STUDY TOP DESK

The most economical chair and study top desk available. Popular tubular steel construction. Correct posture chair with deep saddle seat and exclusive self-adjusting back. Movable — Perfectly Balanced — Durable. Complete details covering sizes and construction on request.

A SPECIAL KUNDTZ SERVICE • • A.I.A FILE 28-B12

for Educators

The Theodor Kundtz Co. has prepared a Specification file covering all types and classifications of school seating. This file, No. 28B-12, will assist you in setting minimum standards as a basis for approval.

for Architects

Educators and Architects avail yourself of this helpful service by writing to our factory at Cleveland or our local distributor. You will find this file of invaluable assistance.

MANUFACTURERS OF SCHOOL AND CHURCH FURNITURE SINCE 1875

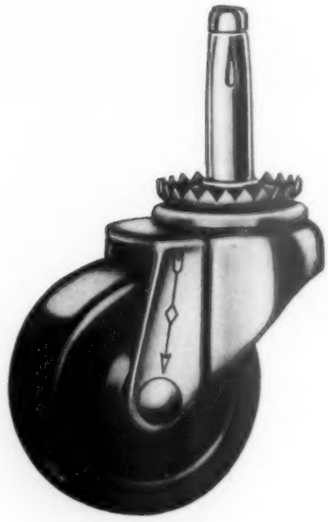
THE BASSICK COMPANY

Bridgeport, Conn.

Bassick

OFFICE CHAIR CASTERS

"DIAMOND ARROW"—BALL BEARING



The Diamond Arrow casters are the highest quality casters for office chair use. They are ideally suited for hundreds of other uses where maximum ease of swiveling is desirable. New patented ball bearing construction gives "Full Floating" action, that provides easier swiveling, lower overall height and greater strength. Available with either "Baco" soft rubber tread or "Atlasite" solid tread composition wheels. All wheels have self-lubricating bearings. Bolt and nut axles are standard.

"Baco" soft rubber tread wheel casters are for use on linoleum, tile, cement or hard wood floors. "Atlasite" solid tread wheel casters are for use on rugs or carpets. Available with 1⅝" or 2" diameter wheels.

Size	Wheel Diam.	Tread Width	Baco Wheel	Atlasite Wheel	Weight Per Set—Oz.
7	1⅝"	¾"	7696	7699	18
9	2"	⅞"	9696	9699	23

DOUBLE WHEEL "DIAMOND ARROW" PIANO CASTER BALL-BEARING

No. 66 Socket

This is an ideal caster for pianos, particularly in schools and institutions where floor protection is to be considered. They are also suited for many other types of heavy furniture.

Casters have the famous "Diamond-Arrow" two level ball bearing construction with chrome steel balls operating on hardened steel raceways, giving the lowest overall height possible on ball bearing casters. Oxidized copper finish.

These double wheel casters when used with No. 66 sockets are an ideal combination for use on pianos which are frequently moved. Socket requires 9/16" bore, 1½" deep. Bottom plate is 2⅛" in diameter with four screw holes.

Numbers	Type Wheel	Wheel Diam.	Wheel Width	Overall Height	Weight Per Set—Lbs.
9006X2	"Baco"	2"	1⅝"	2⅝"	3½
9009X2	"Atlasite"	2"	1⅝"	2⅝"	3½
No. 66 Socket					⅝

CAPITOL STAGE LIGHTING CO.

529 West 45th Street, New York, N. Y.

Write for Your Copy of

OUR LATEST CATALOG ON STAGE LIGHTING EQUIPMENT

Manufacturers of Complete

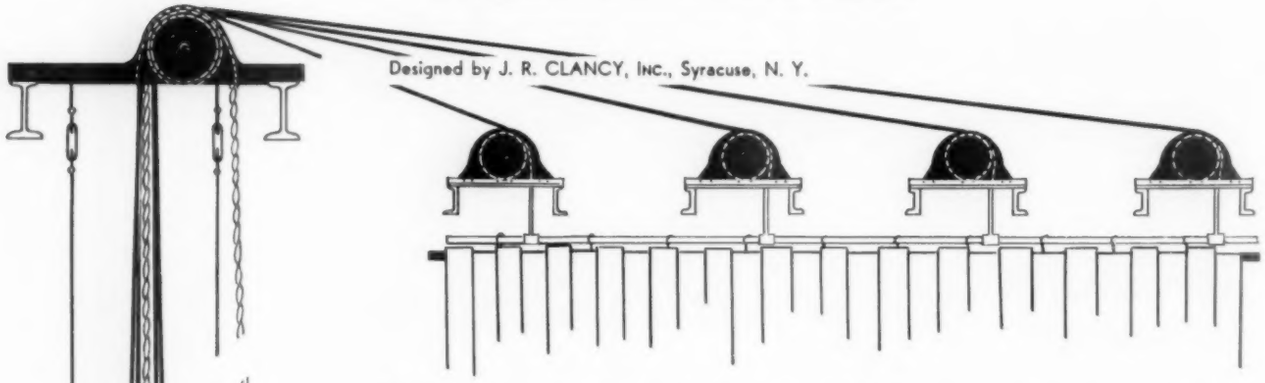
STAGE LIGHTING APPARATUS FOR THE THEATRE, PRODUCTION, AMATEUR THEATRICALS, SCHOOLS, CHURCHES, COMMUNITY CENTER, LITTLE THEATRES, HALLS, ETC.

Aisle Lights
Asbestos Wire
Automatic Colorwheels
Automatic Lighting
Act Announcers
Arc Lamps
Advertising Novelties
Borderlight Cables
Baby Spotlights
Boomerangs
Borderlights
Bunchlights
Cable Clamps
Cable Supports
Carbons
Colorine
Connectors
Crystal Reflectors
Carbon Holders
Cleaner Stands
Colorframes
Colorwheels
Cove Lighting
Crystal Showers
Dissolvers
Dimmers
Dimmer Boxes
Electric Fountains
Electric Coal Grates
Electric Fire Logs
Effects
Exit Signs
Floor Pockets
Fireplaces
Floodlights
Footlights
Film Cabinets
Gelatine
Iris Shutters
Lenses
Light Fixtures
Lobsterscopes
Lugs
Lens Holders
Music Stands
Mirror Balls
Organ Lights
Olivettes
Objectives
Piano Lights
Pipe Clamps
Plugging Boxes
Proscenium Lights
Panel Pockets
Plugs
Reflectors
Rheostats
Sciopticons
Spotlights
Stage Pockets
Stereopticons
Strip Lights
Switch Boxes
Slide Carriers
Scenic Effects
Shutters
Signs
Step Lights
Stage Cable
Switchboards
Torches
Wall Pockets
Work Lights
Etc.

J. R. CLANCY, INC.

Stage Rigging and Equipment for School or College Auditorium Stage

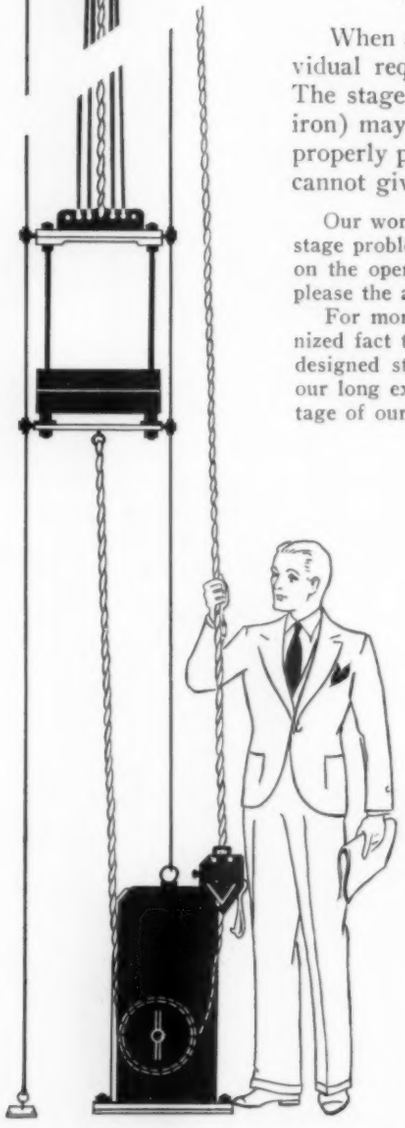
Syracuse, N. Y.



When a new auditorium is built it should have a stage designed to meet its individual requirements, for upon this point will depend the success of the auditorium. The stage should be planned well in advance so that the correct steel work (gridiron) may be provided above the stage for raising the equipment. When this is not properly planned and does not provide sufficient height, strength and safety the stage cannot give satisfactory service.

Our world-wide experience in designing stages of all sizes and types has shown us how to solve stage problems. We know that seemingly minor points—often overlooked—have a major bearing on the operation of the stage. When properly planned for they add the finishing touches that please the audience and encourage the players.

For more than fifty years, we have been designing and equipping stages. It is now a recognized fact that Clancy designed stages assure the utmost flexibility and satisfaction. A Clancy designed stage costs no more—and often less—than those designed without the background of our long experience. If you are considering building or remodeling an auditorium, take advantage of our free engineering service. Here is what we offer you—without cost:



A complete, individual plan for your stage

A complete detailed blueprint in plan and elevation, of the stage showing everything entering into the construction and equipping of this stage.

A complete gridiron steel plan showing proper height and correct spacing of beams—together with accurately figured loads and distribution.

A complete set of standardized specifications.

A list of necessary equipment, with estimated cost.

CLANCY DRAW-CURTAIN TRACK

A unit for use where height is not available for raising a curtain. It opens and closes the curtain smoothly, evenly and quietly—in soft, flowing folds.

This is just one item of the complete line of Clancy stage equipment. We have everything required for the operation of any stage, from the smallest item of hardware to the largest curtain set—including rope, cable, bolts and nuts.

Write for complete catalog.

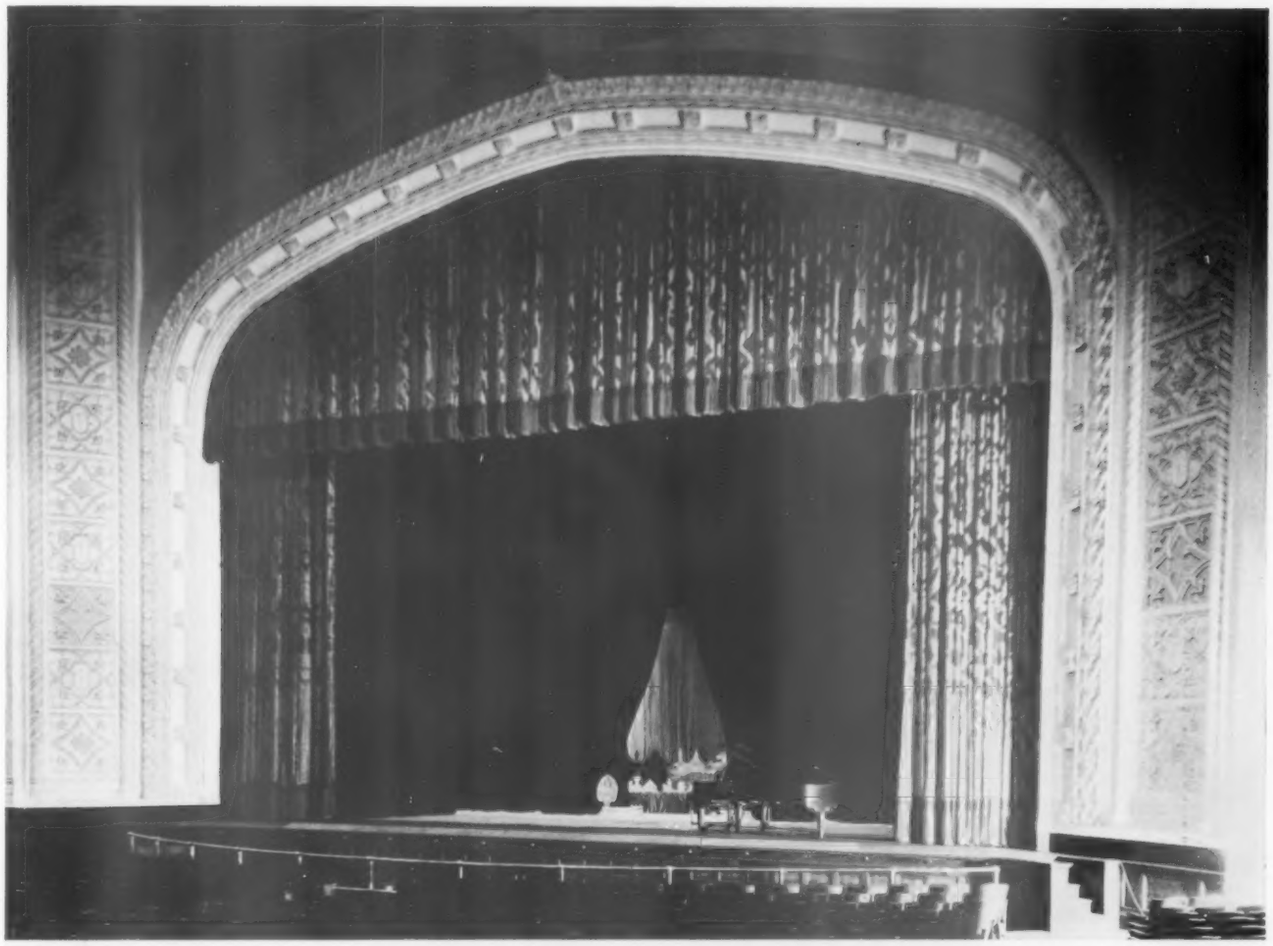
Planning Questionnaire — Free on Request

This questionnaire of important information required to properly plan a stage, is instructive and interesting to anyone associated with dramatics or stage design. A copy will be sent free—on request.

I. WEISS AND SONS, INC.

445 West 45th Street, New York City

ESTABLISHED IN 1900



From ALL THE CHILDREN—37th Annual Report of the Superintendent of Schools, City of New York
Brooklyn Technical High School Stage-Curtains and Drapes made and hung by I. WEISS and SONS, INC.

Specialists in stage equipment for thirty-eight years!

STAGE CURTAINS • ASBESTOS CURTAINS • WINDOW CURTAINS • CURTAIN MOTOR
CYCLORAMA SETTINGS • WINDOW TRACKS • CURTAIN TRACK • PICTURE SCREEN
SCENERY • STAGE PROPERTIES • FLOOR CLOTH • LOCKING RAILS • STAGE RIGGING
STAGE HARDWARE • DECORATIVE ROPING • FLOOD LIGHTS • LIGHTING EFFECTS
FOOTLIGHTS • BORDER LIGHTS • CURTAIN CONTROLS • SPOT LIGHTS • OLIVETTES

FOR FURTHER INFORMATION AND NEW ILLUSTRATED CATALOGUE · WRITE DIRECT

MILLER-BRYANT-PIERCE — Aurora, Illinois.

DIVISION OF L C SMITH & CORONA TYPEWRITERS INC

DIRECT BRANCH SERVICE EVERYWHERE
Established 1896

Manufacturers of
Miller Line Carbon Papers, Inked Ribbons and Stencil Inks

OUT OF 43 YEARS OF INTENSIVE CARBON, RIBBON AND INK DEVELOPMENT AND MANUFACTURE, THE MILLER LINE OFFERS:

MILLER LINE CARBON PAPERS—

Made in a complete variety of weights and finishes, in all standard colors and sizes, for any purpose where a carbon paper may be utilized:

ADDING MACHINE ROLLS—PLAIN OR CARBONIZED
CARBON ROLLS
COPYING CARBON PAPER
ELLIOTT ADDRESSING MACHINE STENCIL CARBON ROLLS
NOISELESS CARBON PAPER
HECTOGRAPH COPYING CARBON PAPER
PEN CARBON PAPER
PENCIL CARBON PAPER
TRACING CARBON PAPER
TYPEWRITING CARBON PAPER

MILLER LINE INKED RIBBONS—

Made regularly in all standard colors and standard color combinations, record or copying, and in seven different degrees of inking, for any machine requiring an inked ribbon:

TYPEWRITER RIBBONS
ADDING MACHINE RIBBONS
ADDRESSOGRAPH RIBBONS
HECTOGRAPH RIBBONS
LITHOGRAPH RIBBONS
MULTIGRAPH RIBBONS
PHOTOSTAT INKED RIBBONS
PURE SILK TYPEWRITER RIBBONS

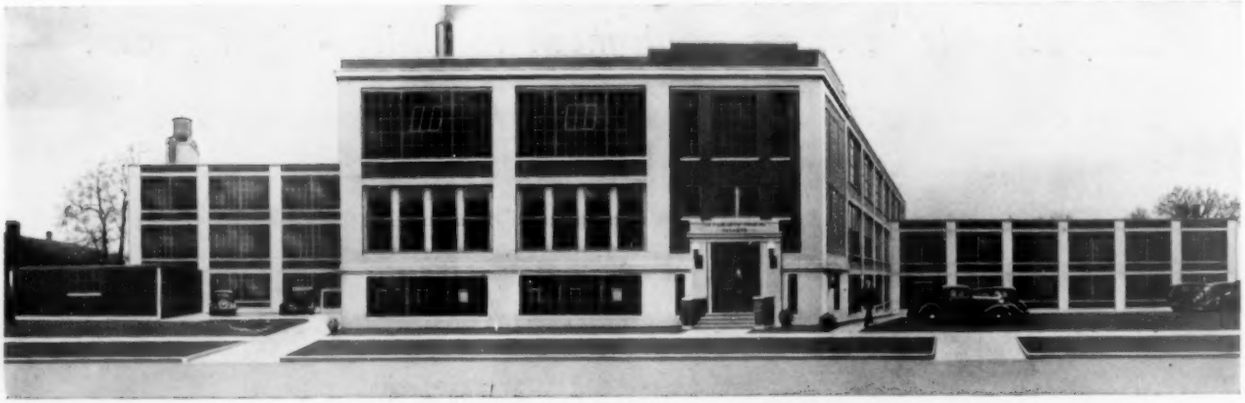
MILLER LINE STENCIL INKS—A proper ink in a convenient container for every stencil duplicating (mimeograph) machine requirement—Open Drum, Closed Drum, Fountain Feed, Portable.

MILLER LINE SERVICE ORGANIZATION. It is the privilege of any user of Inked Ribbons, Carbon Papers or Stencil Inks to enjoy without obligation or expense, the personal counsel and assistance of Miller Line home office or field experts in the application of these products to their every-day uses.

MILLER LINE PLANT AND PRODUCTION ORGANIZATION—

At Aurora, Illinois—the facilities, capabilities and conscientious purpose of which are surpassed by none.

PROMPT AND CAREFUL ATTENTION GIVEN TO SPECIAL OR UNUSUAL REQUIREMENTS BY OUR RESEARCH AND DEVELOPMENT DEPARTMENTS



Miller Line Home Office and Plant at Aurora, Illinois, U. S. A.
Write for Address and Telephone Number of Your Service Center

SECTION VIII
COMMERCIAL DEPARTMENT—ADMINISTRATIVE OFFICE

MODERNIZING CHILD ACCOUNTING RECORDS

By JOHN GUY FOWLKES

University of Wisconsin

"A TRUST I give unto thee"; this, in substance, is what the American public has said to professional educators in the United States for nearly three hundred years. This trust which has been committed to the public schools of this country is in the form of the most valuable resources which a people can ever have; namely, its potential manhood and womanhood. Fulfillment of this unparalleled stewardship can be attained only by giving the best possible environment to boys and girls toward the discovery, emancipation and development of their latent capacities and abilities on the one hand, and by rendering continuous and full account of the stewardship on the other. In other words, it is imperative for a good school system to have an adequate and illuminating system of school records.

The field of school accounting in its entirety falls into the major divisions of:

I. Personnel accounting
II. Money
III. Property

Responsibility for School Accounting

There are four major groups of school administrative officers responsible for school accounting: state superintendents of public instruction; county superintendents of schools; chief school executives of local school systems; and the principals of individual school buildings. Although all these administrative officers are responsible for school accounting to varying degrees contingent upon the prevailing type of administrative organization within a given state, this discussion will be limited largely to child accounting.

How Child Accounting Records Are Used

State Departments of Public Instruction and County Superintendents of Schools.—Some of the most important areas of use of child accounting records by state departments of public instruction and county superintendents of schools, dependent upon the prevailing type of administrative organization within a given state, are: the enforcement of compulsory school attendance laws and child labor laws; apportioning state school funds; formulating and executing supervisory programs; evaluating the existing program of public education; the administration of textbooks; making official reports; conducting research; planning school-plant needs; planning instructional staff needs; budgetary procedures; business management; formulating and executing public relations programs; determining tuition charges for non-resident students; administering transportation; making administrative analyses toward greater efficiency and hence more functional opportunities for children; and a miscellaneous area involving such things as the administration of special programs—for example, the education of handicapped children; cooperating with other welfare and educational agencies.

In addition to the above enumerated areas of service in which child accounting records are used by state departments of public instruction and county superintendents, these offices also find it imperative to keep certain basic information on teachers in connection with the administration of certification, salary, retirement fund and tenure laws, as well as certain records pertaining to school plants and school monies.

Local School Administrators.—Some of the major areas of activity in which child accounting records are used by local school administrators are: determining building needs; determining instructional staff needs; budgetary procedure; instructional staff assignment; individual school schedules; making official reports; teaching, guidance, placement; the public relations program; enforcement of compulsory school attendance laws; determining tuition charges for non-resi-

How the State Department of Public Instruction of Florida is keeping a record of its 18,000 teachers. One of these cards is kept on file for each teacher in the state

Left—back (top) and front (bottom) of teacher's card; right—inside of same card

dent students; supervision; business management; administration of special education; administration of pupil transportation; and administrative analyses making possible greater efficiency and more functional opportunities for children.

Because of its marked significance, a few comments concerning the utilization of child accounting records in connection with teaching will be offered. It is currently accepted that true teaching is the stimulation and direction of learning, and that the school curriculum is the sum total of experiences which the school makes it possible for the child to have. In light of these concepts, it is clear that it is the teacher's obligation to provide varied and numerous channels of learning in keeping with the capacities and interests of children. It is recognized that reading is only one of many necessary avenues of learning. Activities, excursions, discussion, laboratories and projects are all recognized in the good school of today as equal to, or indeed in some instances superior to, reading as a means of learning.

It is clear that a teacher must be intimately and conversantly familiar with the history, achievement and failure, virtues and vices of each child if the optimum opportunities are to be offered to boys and girls in school. A teacher can acquire this highly personalized acquaintance with each and every child only by having full and valid information concerning each child. Consequently, it is evident that child accounting records loom large in the teaching venture. As is the case with state departments of public instruction and county superintendents' offices, local school administrators likewise find it necessary to keep certain information upon the teaching and custodial staffs and the school plant, but here again lack of space prevents detailed discussion of these types of accounting records.

Types of Child Accounting Forms Necessary

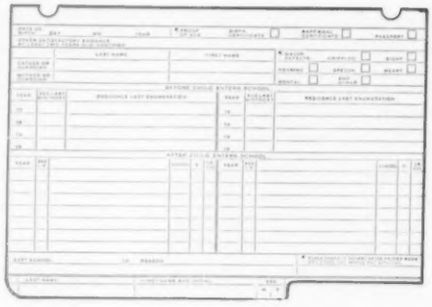
The basic record forms essential for a good system of child accounting are:

1. The individual child census card
2. The family census card
3. The individual child registration card
4. The pupil's daily schedule card
5. The pupil's permanent cumulative record

Because of its major importance, a few observations on the permanent cumulative record card will be offered. The cumulative permanent record card should give certain basic personal data pertaining to the child, such as date and place of birth, authority for date of birth, residence, family status, health record, a few basic facts concerning parents, school history of the child, including the attendance record, ability and

achievement record, extra-curricular record, and any unusual incidents in the life of the child.

Because of their importance, many schools find it desirable to keep separate individual record cards pertaining to the health, ability and achievement record as measured by standardized tests and the extra-curricular record. Here again, limitation of space prevents an extensive treatment of these various types of record cards.



Many schools in New York keep their individual child census records in visible form. It is possible, by using the visible edge of the card, to compile data required for reporting to the State Department of Public Instruction in easy and quick fashion

Some Principles for a Good System of Child Accounting Records

Some of the major requirements for a good system of child accounting records are:

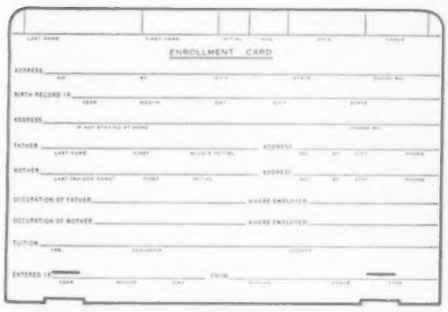
1. *Continuous child accounting records.*—This principle demands that unbroken accounting be made of each and every child from the time he is legally recognized by the prevailing school census law up through the time he is dropped from the official school census. Indeed, in light of the fundamental sociological significance of personnel accounting, there is good reason to support the contention that every child should be entered upon the school census at the time of birth. Also, in light of the contemporary expansion of local school offerings for adults, there is no little justification for keeping a person upon the school records indefinitely.

2. *Conformity with the prevailing legal requirements imposed upon the school.*—Compulsory school attendance and child labor laws are striking illustrations of the soundness of this principle. Also, in the light of the increasing amount of cooperation between the public school system and other welfare and legal agencies, it seems not unlikely that additional jurisdictions and functions with respect to children will be assigned to the public schools.

3. *Only relevant and usable data.*—There is a tendency in some quarters simply to "pile up" information about children. Only data which are revealing and helpful in the execution of various school functions should be included in child accounting records.

4. *Usability.*—In many ways, from a practical point of view, this is the most exacting requirement for a good system of child accounting records. Usability of child accounting records is obviously very closely and intimately connected with the way in which school records are filed.

Front

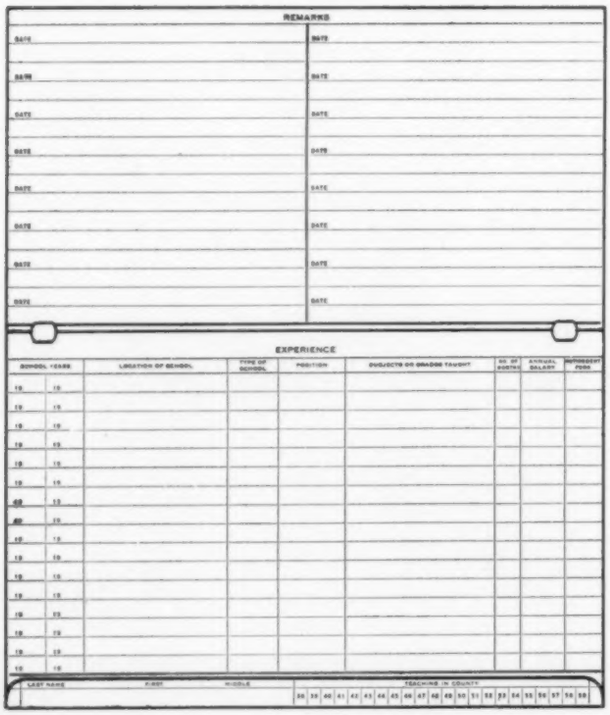


Back

How the Franklin Junior High School of Green Bay, Wis., carries its registration and individual pupil daily schedule record. The revolving stand, kept on the counter in the outer office of the administrative suite, makes easy the use of the registration and daily schedule records of each individual school

Above—Back, front and inside of the form on which Sheboygan County, Wisconsin, keeps cumulative records on the individual children

Below—Back, front and inside of the form on which Sheboygan County, Wisconsin, keeps basic teacher records



Filing Child Accounting Records

From the standpoint of use, it may be said that all child accounting records fall into one of three major categories—(1) active, (2) transitional, (3) dead.

There is increasing evidence that basic child accounting records remain active indefinitely, and there is also no little justification for the thesis that no

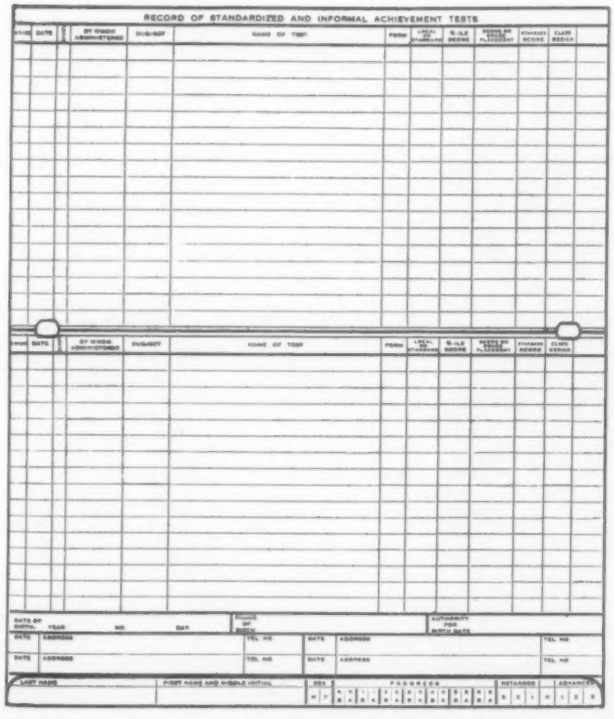
basic child accounting record should ever be considered really dead from a filing standpoint.

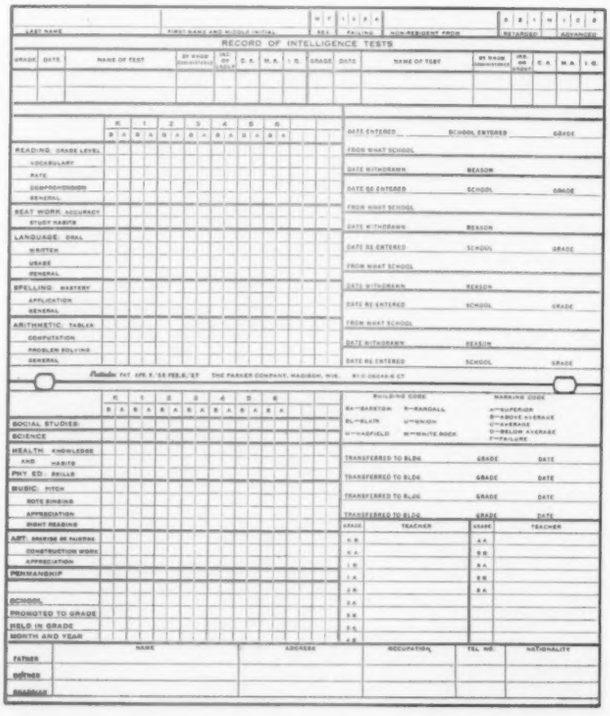
From a mechanical standpoint there are two basic ways in which school records may be filed; namely, blind or vertical filing, and visible filing. Douglass, in his work entitled "Organization and Administration of Secondary Schools," * writes as follows:

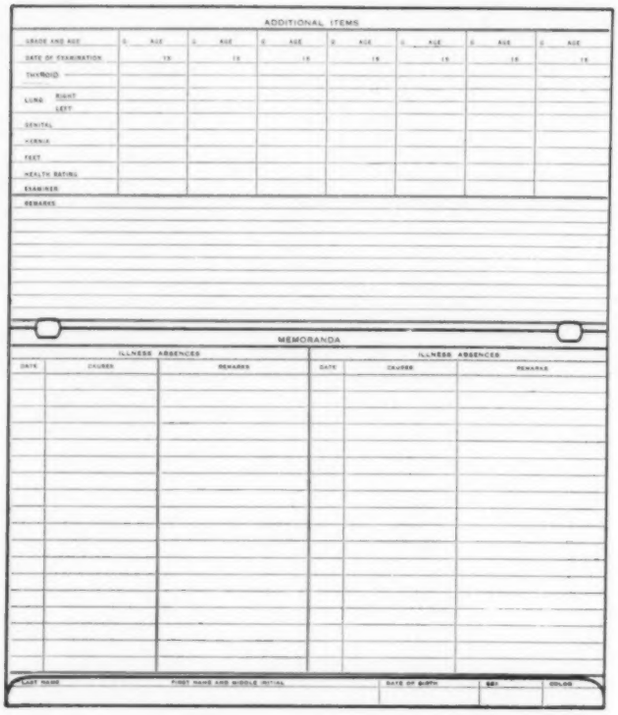
* Harl. R. Douglass: "Organization and Administration of Secondary Schools." Ginn and Company. p. 390.

Above—Back, front and inside of the form which is in use in Sheboygan County, Wisconsin, for keeping miscellaneous individual school district records

Below—Back, front and inside of the individual cumulative record which Waukesha, Wis., is using







Wisconsin Rapids, Wis., has established a special health record which makes it easy for the nurse to transport the health records of individual children to the various buildings throughout the city in convenient and safe fashion

Above—Back, front and inside of special health record

Below—Records and movable filing case in use

"The Filing of Records—The Packet System.—Of late a number of schools have begun to employ what is called the packet, or folder, system. In this plan most of the records of one child are kept in one packet or folder.

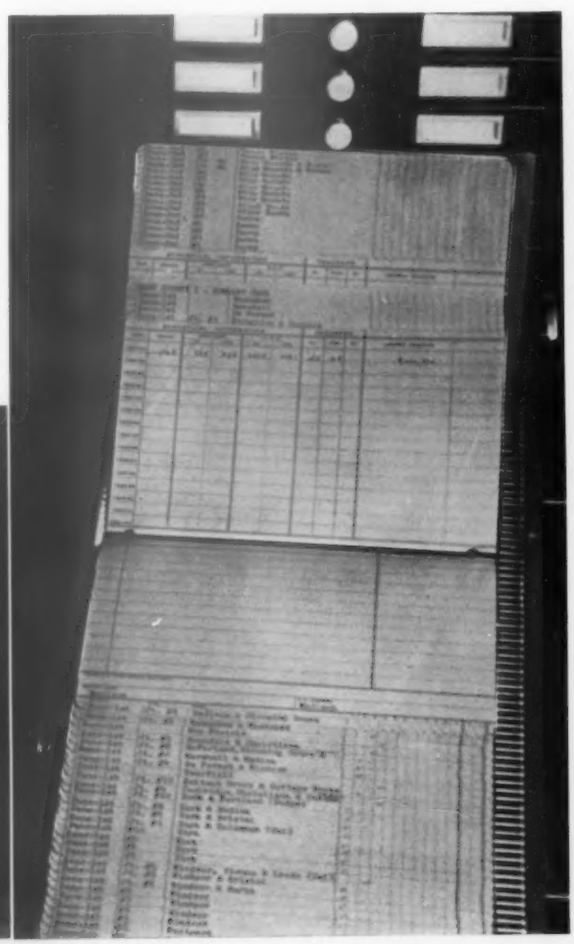
"The packet system has one outstanding advantage and several limitations. More often than not, when it is desired to investigate the records of a pupil, more than one type of record is needed. Where the packet system is employed, it is necessary to look in but one file—the packet file—to locate all the records. Among its disadvantages may be mentioned that its use makes the recording of records cumbersome and requires more time. Moreover, when one investigator wishes to examine one complete set of records (for example, the records from achievement tests) he ties up the entire file, preventing other workers from employing any of the records of the same pupils unless he takes the trouble to remove all the achievement-test cards from the packets, to be returned later when he has finished with them."

As Douglass so clearly shows, blind or vertical filing does not make essential school data easily, immediately and constantly available. Similarly, blind or vertical filing is wasteful and awkward in the posting and using of school records. Unfortunately, far too many schools still follow blind filing in the housing of child accounting records.

How the State Department of Public Instruction in Wisconsin keeps individual district financial data

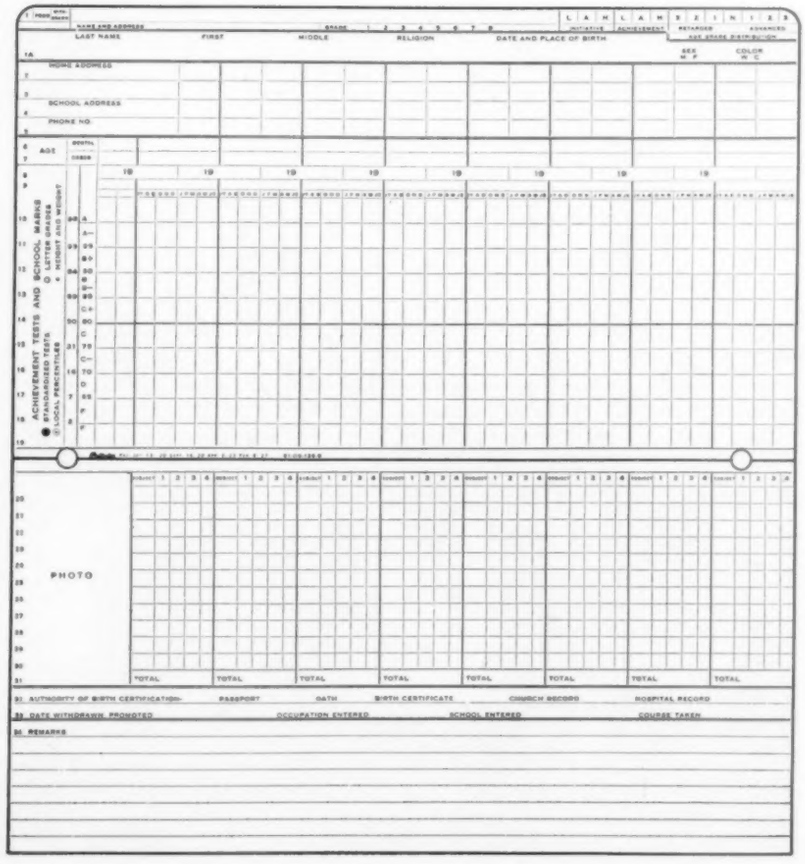
Above—Back, front and inside of the record card

Below and right—The flat drawers require very little space, and the records are easily accessible



proves most satisfactory, depending upon the way in which the records are to be used. For records that are to be kept in one central office and seldom if ever removed from the office, the drawer type of equipment, as illustrated by the installation of the State Department of Public Instruction of Wisconsin, seems superior. Records that are transported from place to place somewhat frequently can probably best be housed in the flat book visible file.

How the permanent cumulative record recommended by the American Council of Education may be made available in visible form. Many cities throughout the country, particularly in Pennsylvania, have transferred the American Council Card to this form. Back and front of the form are shown at the right; the inside is shown below



How Some Schools Have Modernized Child Accounting Records

Visible equipment for child accounting records seems to be essential in the modernization of the child accounting system of any school unit.

In these pages is given a random sampling of illustrations of child accounting records that have been made visible and hence conform with the requirement of availability. It is hoped that these illustrations of "making child accounting records visible" and hence more usable will prove helpful in the improvement of public school systems throughout the United States.

Housing Visible Records

As can be seen from the exhibits of Wisconsin Rapids and the Wisconsin Department of Public Instruction, there are two basic ways in which visible child accounting cards may be housed; namely, the drawer type of equipment and the flat book visible file with cabinet. Either type of housing

THE ORGANIZATION OF A HIGH-SCHOOL COMMERCIAL DEPARTMENT

By JOHN N. GIVEN

Supervisor, Commercial Education Section, Los Angeles City Schools

THERE is an old Spanish proverb, "Del dicho al hecho hay mucho trecho," which means, "Between the saying and the doing there is a wide trench or gulf." This would hold true with respect to the matter of curriculum construction. To theorize about the philosophy, trends, and present practices in curriculum construction is one matter. To set up a workable program of offerings to meet a specific community situation is quite another thing.

Methods of Curriculum Planning

There are several approaches to the selection of curriculum content:

1. The acceptance of traditional courses in whole or in part.
2. The imitation or the "scissors and paste pot" method. By this method the curriculum expert obtains courses of study from various school systems in the country. Then, with a pair of scissors he cuts out of each program those things which he thinks are most desirable to fit into his own situation and, with the aid of some paste, a new curriculum evolves.
3. The acceptance of prevailing practices by the frequency of their occurrence. Under this plan no real improvement can be made in curriculum planning, since this procedure involves simply a refinement of current practices.

Developing a Business Education Program

The major questions which must be answered in developing a program of business education are these:

(1) What are the criteria by which you decide what is valuable and what is not valuable?

(2) When is a subject vocational and when is it not? Latin studied by the student who is planning a medical career is a vocational subject; English studied by the student who aspires to a journalistic position is a vocational subject; chemistry and physics studied by the young man who expects to become an engineer are vocational subjects.

(3) What is the purpose of business education? The philosophy of business education has undergone tremendous revision during the past few years. In the earlier days the sole objective was that of vocational efficiency. The scope of the work now encompasses a much broader field than that of job efficiency. Business education today has three distinct and definite objectives—which may be classified as the personal, social, and vocational aims. It goes without saying that there is a business side to every occupation and a business side to every social institution. There can be no argument on the point that if one is to become a really intelligent member of society, he should have an appreciation and an understanding of the largest segment of our daily life, that of business activity. If the school does not give the student an appreciation of the elementary concepts of the social and economic life into which he is soon to be placed, it is being unfaithful to its trust—the belief that students should be trained to take an effective part in an efficient society.

In spite of wishful thinking on the part of educators, however, the fact remains that the vast majority of young men and women major in the field of business education with one idea—that of being prepared sufficiently to hold a position in the business world when they graduate. This aim is of tremendous importance. To be able to appreciate art, music, and literature is an estimable quality, but to have the skills and other tools by which one may earn a livelihood in order to be able to enjoy these fine things is of equal importance.

Students in Commercial Courses Versus the Actual Business Set-Up

Before developing a commercial curriculum in any city, those in charge of the program should give careful consideration to the current enrolment trends throughout the United States. It is safe to assume that in the year 1938 the largest enrolments are to be found in the fields of bookkeeping and stenography. Although there is increasing emphasis on work in the field of salesmanship, the number of students who major in the merchandise and general-clerical fields is almost negligible when compared with the number of students enrolled in the other two. A perusal of the gainfully employed workers in business occupations gives us an entirely different picture in the business set-up. Government figures show that the largest group of gainfully employed are those that may be classified under the heading of clerical activity. The second largest group of gainfully employed people in

business activity are those in the accounting and secretarial fields. It may be seen that there is a direct inverse ratio between those individuals gainfully employed in business and the number of students enrolled in the various commercial curricula. Is this a satisfactory situation? The answer is emphatically "No!"

The two reasons for this situation are recognized by anyone who is at all familiar with the situation. The first is of course the lack of trained guidance personnel in a majority of our schools; a limited personnel that is also insufficient to handle the job of guiding boys and girls into the fields of their choice, interests, aptitudes, and abilities. Secondly, we have developed no sound prognostic tests in the fields of shorthand and accounting which foretell the probable future success of the students who wish to prepare for careers. Leaders in business education were the first to realize this emphasis in the wrong direction, and some steps have been taken to correct this evil by setting up adequate guidance facilities.

The lack of interest on the part of students in the field of merchandising may be traced to some extent to the inability of school systems to obtain well-trained teachers. The type of successful salesman who would make a fine addition to a faculty is not interested in the salary which is paid the average high-school teacher. It often happens that in our own department the student who fails to measure up to the qualities necessary for work in the fields of bookkeeping and shorthand is allowed to enroll for work in the merchandising and general-clerical fields.

Some educators have been concerned because enrolments in business education are out of proportion to the vocational needs of business. Few schools have any requirements for courses in the commercial department such as they have in the fields of English, social studies, and physical education. The department is large because the students also feel that the department can contribute something to their general education. We have a tendency to compare the enrolments in business education today with the present job situation. It would be unwise and unsound for us to advise our students who are entering the ninth grade that business, four years hence, will be in the same condition that it is at the present time.

An Intelligent Method of Procedure

With the foregoing concepts as more or less background information, what are the tangible, definite procedures which may be followed in the development of a curriculum in the field of business education?

First, let us accept the initial thesis that the commercial education department should not be the dumping-ground for the student who, for one reason or another, is not qualified to continue with the formal academic-training program. The dumping-ground theory has been modified during the past few years, yet it still persists in many schools. In too many schools Latin is still required of all students. The student who cannot master this language is transferred, in many instances, to a class in junior business training, which is the introductory course to the commercial program of studies.

Second, we must realize that each locality presents a different need. The program which is satisfactory in a town 2,000 miles away is not necessarily the program which will be of value to a specific community.

Third, we must realize that the commercial offerings may logically be divided into two divisions—the social-business subjects and the vocational subjects. The vocational subjects should be placed in the two years prior to graduation; namely, grades eleven and twelve. Few, if any, general school requirements should be placed in these two years, for it is certain that the student will need the most intensive type of skill training nearest to the time of use.

Next, we need to make a job survey of our own community and all adjacent communities in order to discover at first hand what the job situation is. Is there a need in the community for stenographers, for bookkeepers, for clerks, or for sales people? What happens to the graduates of the school system? Are they all going to colleges, or are vast majorities of them drifting from here to there trying to find work of any kind? There is no better tie-up between the educational administration and the local business interests than to have an educational survey made of the community with the cooperation of the local chamber of commerce, the service clubs, and those in the field of education.

Next, a definite guidance program should be developed, in order that some help may be given to the student in setting up his commercial pattern. It is questionable whether all students who express a desire should be allowed to enroll in shorthand or advanced bookkeeping classes. A personal interview, based upon certain data relating to intelligence quotients, personality factors, and to grades received in English, will do much to deter many students from following the field of shorthand. Many students, even though they are proficient in shorthand, have little hope of success in their chosen field because of lack of acceptable personality traits. If these objectionable traits cannot be discovered and overcome, certainly these students should not be allowed to waste two years of intensive effort on a highly skilled subject.

Three Suggested Curricula

For the typical high school, with an enrolment of from 500 to 600 students, three curricula may be de-

veloped: (1) the secretarial sequence; (2) the bookkeeping-general-clerical sequence; (3) the merchandising-salesmanship sequence. The introductory work basic to these fields might be included under the headings of junior business training in grade nine, and elementary bookkeeping and typewriting in grade ten. The type of bookkeeping which would be most valuable on this grade level would be that which would stress the general-business-information values rather than the vocational outlook. In grade eleven the program might be logically divided into three patterns: the study of elementary shorthand for the stenographic group; the study of vocational bookkeeping by the bookkeeping-clerical group; and the content of elementary salesmanship by the salesmanship and merchandising group. This program would continue with related subjects in grade twelve and would be completed in the last semester of the twelfth year with a business practice course in each of the three fields. Here the student would get actual business information in a hypothetical office set up in the school, or he might be allowed to augment his school work by cooperative part-time training in business in the community.

Finally, we must realize that there is no one best curriculum that will fit all the needs of all the communities, just as there is no one best method of teaching. We must take into consideration the time which the students give to their studies, their future interests, and the needs of the local community.

THE SELECTION OF EQUIPMENT FOR BUSINESS EDUCATION

By HERBERT A. TONNE

Associate Professor of Education, New York University; Editor, Journal of Business Education

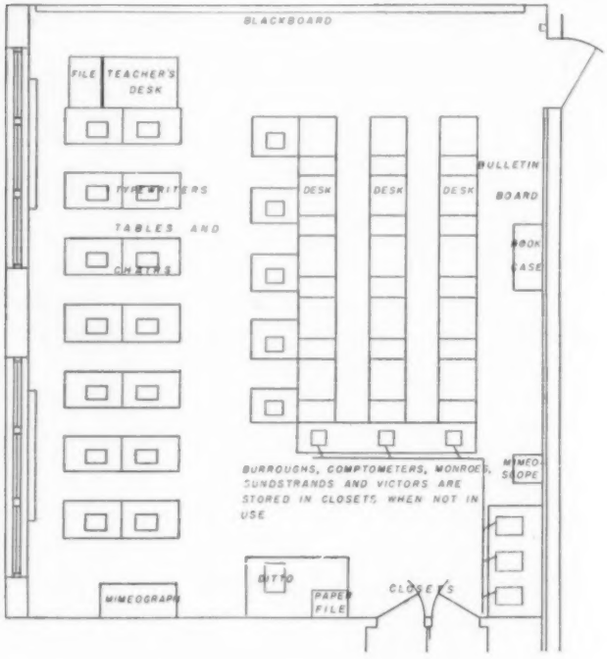
THE basic elements of education are the teacher and the pupil. However, in an educational system such as that of the United States, with approximately thirty million pupils and more than a million teachers, several other factors are vital to good teaching—administration, supervision, school buildings, curricula, textbooks, equipment. In training for business, as in other departments of education, equipment should be selected to meet the fundamental needs for good instruction, rather than on the basis of habit, sales pressure, or current fad.

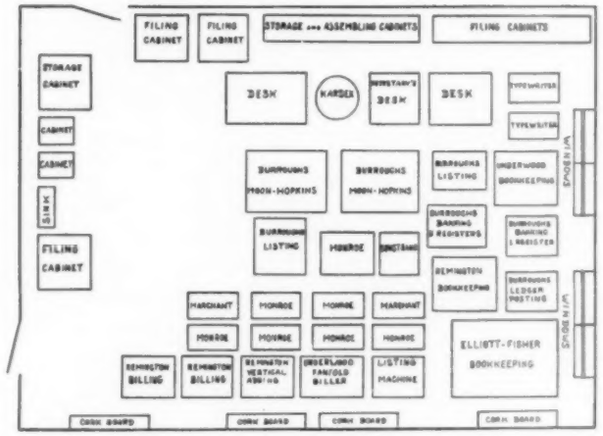
Vocational Training a Primary Goal

In deciding upon the kind of equipment for business education, we must first look at the fundamental purpose of such education—training for initial jobs, and in-service training in office and sales occupations. In too many schools this has been interpreted as training for clerical positions; that is, stenographic and bookkeeping occupations.

A form of stenographic training can be given with little equipment. Desk, notebook, pencil, and competent teacher are the basis for stenographic instruction; to which good typewriters must be added. For several decades it was true that with superior teachers, superior pupils, and an increasing demand for trained stenographers, graduates of business schools could secure positions without much difficulty. The situation has now become more difficult, and we are therefore spending more time and effort on stenographic training. Equipment and books have become specialized. The teacher is aided by various supplementary devices, such as charts, metronome, special gadgets for preventing pupils from looking at the keyboard of the typewriter, etc. These material aids are desirable, but none of them is of any value without a competent teacher.

Until recently, the amount of equipment needed and available in the field of bookkeeping was meager. Somewhat longer desks, special paper and adequate blackboard space sufficed. The idea of setting up the bookkeeping room in the form of a bank with a cashier's cage, etc., went out more than ten years ago. The tendency to extreme diversification in bookkeeping occupations, resulting in the development of numerous forms of bookkeeping machines, has gradually permeated into the high school and has resulted in the purchase of many of these machines, not only in private business schools and in junior colleges and other institutions of the post-high-school level, but even in secondary schools. The value of such training on the secondary level, and even on the post-secondary-school level, may be seriously questioned, because we have not undertaken adequate study to determine whether there is sufficient job frequency to make possible a meeting of employer and prospective employee.





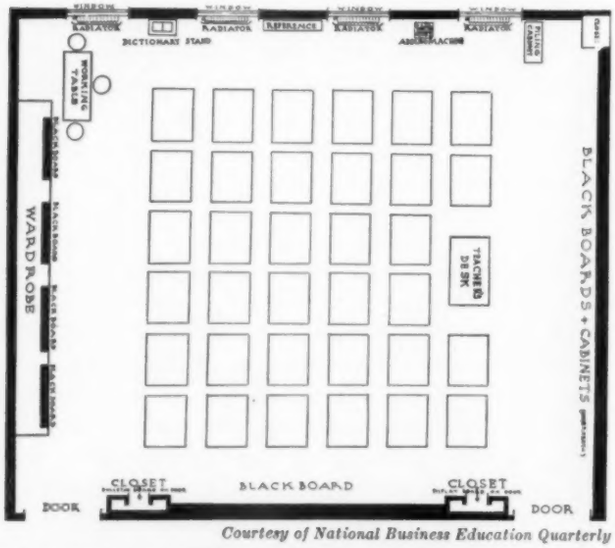
Above—Floor plan, bookkeeping and billing machine room, Roxbury (Mass.) Memorial High School

Courtesy of the Business Education World

Left—General office practice room, Thomas Jefferson High School, Elizabeth, N. J.

Courtesy of National Business Education Quarterly

Unfortunately, almost all our equipment buying has gone in the direction of these two occupational opportunities. Although there are many more highly specialized clerks undertaking non-bookkeeping and non-stenographic types of duties than there are bookkeepers and stenographers combined, practically nothing has been done in secondary schools, and very little on the post-secondary-school level, to meet the need of students. It is true that courses in office practice have been established in a considerable number of schools; but in most cases their equipment is inadequate. The little equipment that they do have is chiefly of value in finishing training for stenographic and bookkeeping occupations.



Courtesy of National Business Education Quarterly

Floor plan of a bookkeeping classroom set-up in a Brooklyn (N. Y.) school

Even more important than the clerical occupations are the distributive occupations. There are more people concerned with some form of distributive occupation in the United States than are concerned with all phases of office occupations combined. There are over a half-million students of bookkeeping and over a half-million students of stenography; and certainly under a hundred thousand students in distributive training in secondary schools. The kind of training given to these retailing students is usually of a general nature by teachers who often have little distributive occupational experience and are almost always without adequate equipment. Only a small number of schools have store equipment of more than the simplest type. Store equipment of a real type is needed in good distributive training.

To summarize our presentation thus far: In the field of business education, we lack adequate equipment; and the little equipment that we have is not best fitted to our vocational needs.

Secondarily, General Business Knowledge

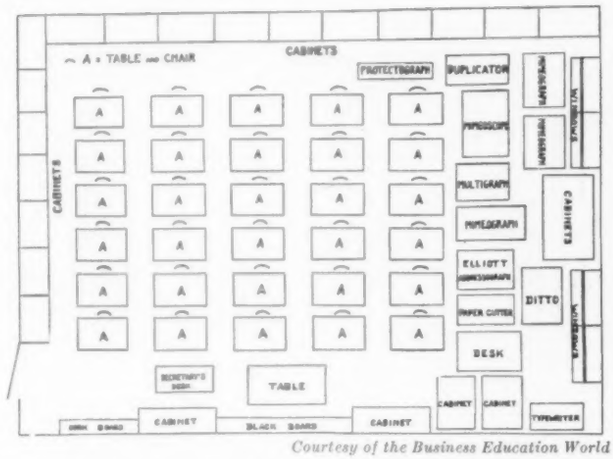
The second major objective of business education is to give all students on the secondary level some understanding of the methods used by business in rendering services to all of us. Business is one of the major institutions in our social life. In the field of science only the technician can make significant advances; in the field of business, however, progress depends upon the good economic judgment of the average person rather than on the profound thinking of the scientist. For this reason it is our definite conviction that the manner in which we may make use

of the services of business should be a phase of the secondary school curriculum for every pupil. Whether this group of learnings should start within the department of business education, or some other department, or in a grouping of departments, is of comparatively minor consequence if in the process of dividing these learnings we do not forget the need for efficiency in our teacher.

A core-curriculum subject in the personal use of business does not require highly specialized equipment. It requires pleasant surroundings, good provision for seeing, and, above all, an efficient teacher.

General Suggestions

The fact that highly specialized and over-elaborate equipment is not needed in commercial education should not result in treating it as a stepchild. In contrast to the expensive equipment secured for departments of home economics and industrial arts in some schools, it has sometimes been impossible to secure a few hundred dollars' worth of vitally important equipment for business training. This has been partly the fault of teachers of commercial subjects in failing to present their problems adequately to the administrators. More of the fault, however, should be charged to administrators who fail to realize that commercial education does have some specialized applications and therefore, in our highly complex economic life, demands a certain amount of specialized

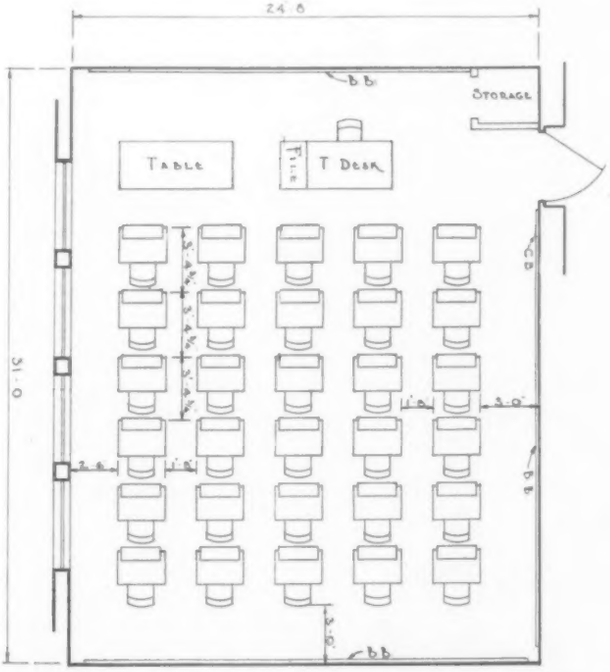


Courtesy of the Business Education World

Arrangement of equipment in the duplicating and filing room, Roxbury (Mass.) Memorial High School

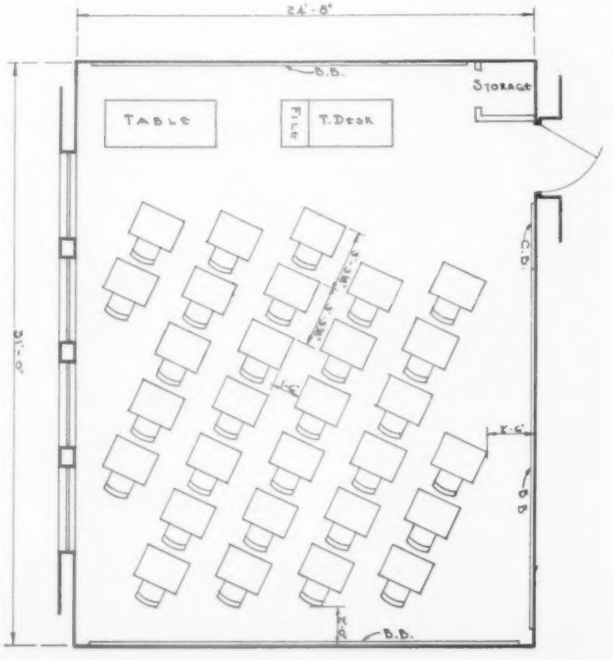
equipment. If students are to get jobs when they are graduated from our schools, they must be trained specifically and efficiently to use the equipment available in offices. General training is valuable as a means of developing personality, but without the specific skills needed in many business occupations personality does not help the pupil to get his initial position.

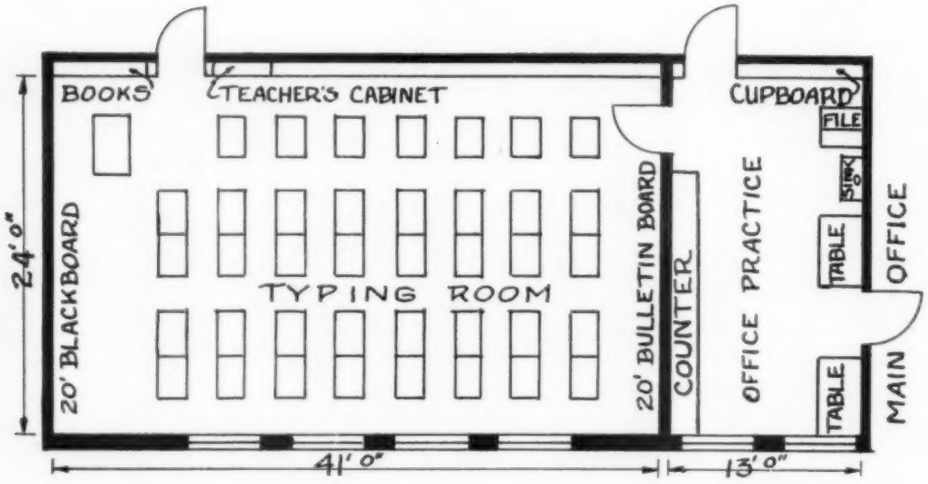
In planning the work of commercial education, it is wise to keep the instruction in one part of the building as far as possible. If the commercial de-



Above—A suggested seating arrangement and floor plan for a bookkeeping classroom. The more usual desks, such as those shown in the plan at the right, could also be used in this conventional set-up

Below—A diagonal arrangement of pupils' desks is sometimes advocated to secure better light in bookkeeping classrooms, as for other rooms where a great deal of continued close work is carried on





The typing room at Corvallis (Ore.) High School is 40' long, 23' 6" wide and 12' high. A ceiling of acoustical tile does away with the usual rumbling sound

Courtesy of National Business Education Quarterly

partment is to carry on a considerable amount of the school business, the rooms of the department should be on the office floor. Provision should be made for the later expansion of the department on the same floor.

Brief comment on the equipment needed for typing instruction and for economic geography is given to supplement the material presented in previous volumes of THE AMERICAN SCHOOL AND UNIVERSITY.

Typing Equipment

The tables on which typewriters are placed should be provided with means of adjusting the heights; or several heights of tables should be available to accommodate the different writing positions of pupils. The chairs should also be adjustable or of different heights. Care should be taken to see that the tables are free from vibration.

Drop-head type desks should ordinarily not be bought for the typing room, because of their expense and use of space. If other types of instruction are to be given in the room, such desks may be desirable.

Phonograph equipment and records for rhythmic drills are demanded by some teachers. The value of such work has not been proved. It may be of little more than temporary motivating value. An inexpensive time device is essential.

Most important of all extra equipment is a demonstration table that can be elevated so that it can be seen from all parts of the room.

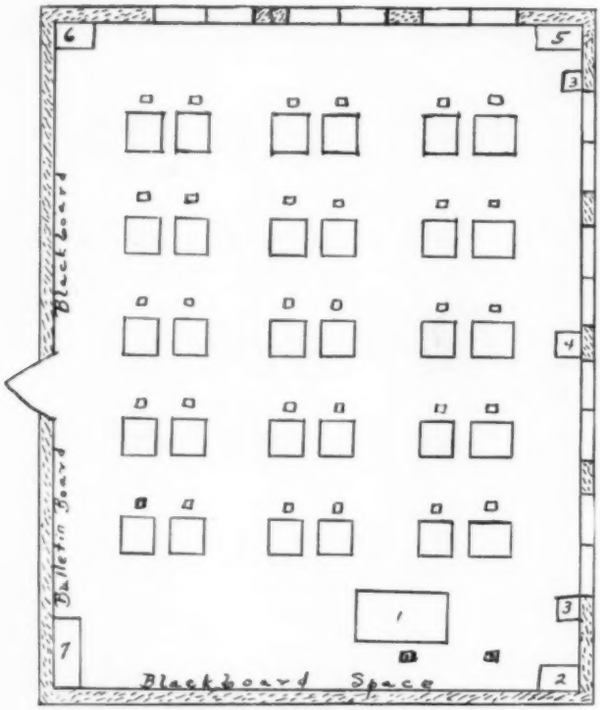
For a class in beginning typing it is probably wise to have all machines of one standard make and one given year. This is made possible by turning in all typewriters every three years. This will be found least expensive in the long run, if the machines are used to any considerable extent. Classes in advanced

Note the good form of these young typing students. This is a fundamental phase of job skill development

Left—The modern high-school business department gives training in the use of a considerable number of office machines

Right—An attractive classroom is a basic requisite to good business training

Left—Good penmanship is still necessary in business. The penmanship class must be remedial to learning in all classes, rather than a substitute for such training



Submitted by Jane E. Clem, State Teachers' College, Whitewater, Wis.

Typewriting Room Floor Plan

typing should use a considerable variety of the more frequently used types of machines.

Economic Geography Equipment

Where possible, a special room should be used for this subject. A complete supply of maps is not a luxury for this type of instruction—it is a necessity. Provision should be made for the use of an opaque projector and, where available, for the use of motion pictures. However, teachers should not make the lack of this type of material an excuse for poor teaching. Such aids are primarily motivating devices, and the skilled teacher can use other means of motivation. This statement should not be construed into a statement that such equipment is not desirable. The room should also have extensive display cabinets for exhibiting the materials of geography. A filing cabinet for the storage of display material not actually in use is almost a necessity.

Many further suggestions will be found in numerous articles in previous editions of THE AMERICAN SCHOOL AND UNIVERSITY devoted to the teaching of geography in elementary and junior high schools. Their suggestions quite generally apply to economic geography on the high school level.

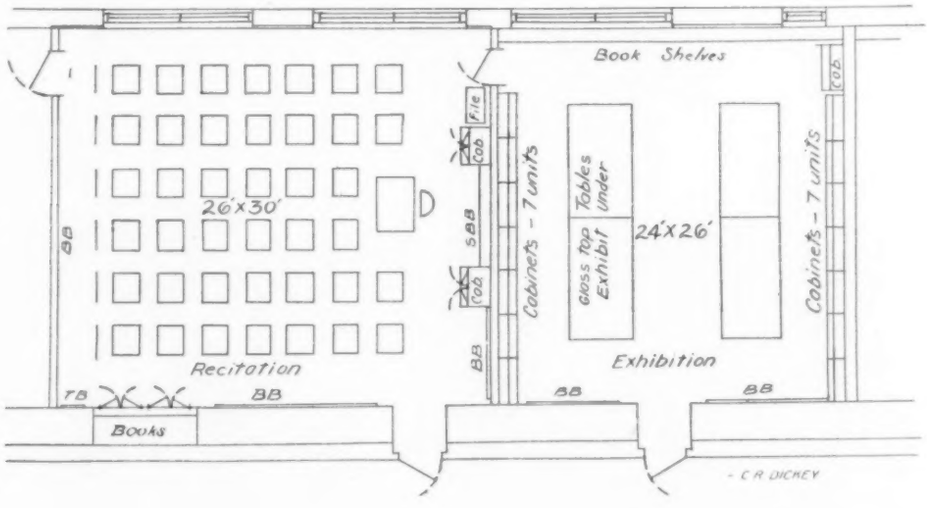
Bibliography

IN THE AMERICAN SCHOOL AND UNIVERSITY

"Design and Equipment of Rooms for Commercial Education in High Schools," by Clyde B. Edgeworth; Vol. III, p. 374.
"Equipment for Bookkeeping and Accounting Classrooms," by Paul S. Lomax and Peter L. Agnew; Vol. III, p. 377.
"Equipment Needed for a High School Commercial Department," by Frederick G. Nichols; Vol. V, p. 227.
"Office Machine Equipment for the School with Moderate Funds," by Grace M. Kennedy; Vol. VI, p. 218.
"Office Practice—An Integrated Laboratory Project," by Edward J. McNamara; Vol. VII, p. 233.
"Equipment of the General Business Training Classroom," by Foster W. Loso and Herbert A. Tonne; Vol. VIII, p. 265.
"Setting Up Facilities for an Office Practice Course on a Modest Budget," by A. C. Beaver; Vol. IX, p. 283.
"Providing Suitable Facilities for Commercial Instruction," by Paul M. Boynton; Vol. X, p. 418.
"Secretarial Practice Set-Up in the Senior High School, New Rochelle, N. Y.," by Wallace B. Bowman; Vol. X, p. 420.

IN OTHER PUBLICATIONS

"Floor Plans for the Commercial Department," a complete issue of *National Business Education Quarterly* (Herbert A. Tonne, Editor); Vol. V, No. 2, December, 1936; out of print.
"Office Practice in New York Schools," by Clinton A. Reed; in *The Journal of Business Education*, September, 1935.
"Commercial Education Equipment for Small High Schools," by William R. Odell; in *School Executive Magazine*, September, 1932.
A section on "Commercial Rooms in School Architecture," by John L. Donovan and others; published by The Macmillan Company, New York, 1921.
"Teaching Devices and Classroom Equipment": Sixth Yearbook, 1933, of the Eastern Commercial Teachers Association, 1200 Walnut Street, Philadelphia, Pa.



Economic geography exhibit and classroom, Dorchester (Mass.) High School for Boys

Plans on this page by courtesy of National Business Education Quarterly

ART METAL CONSTRUCTION COMPANY

Jamestown, New York

BRANCH OFFICES

Baltimore, Md.	Cincinnati, Ohio	Hartford, Conn.	Los Angeles, Cal.	Philadelphia, Pa.
Boston, Mass.	Cleveland, Ohio	London, England	Memphis, Tenn.	Pittsburgh, Pa.
Chicago, Ill.	Detroit, Mich.	Kansas City, Mo.	New York City, N. Y	Washington, D. C.

600 SALES AGENTS IN ALL PRINCIPAL CITIES

"It is imperative for good school systems to have an adequate and illuminating system of school records." Consistent with its policy and its obligations to study school requirements and to produce equipment scientifically designed to serve such requirements, the Postindex Company Division of the Art Metal Construction Company has engaged Dr. John Guy Fowlkes, Professor of Education, University of Wisconsin, as an editor for its School Records Division. Through Dr. Fowlkes it is possible for Postindex to adapt any school record now in use to visible equipment or to design records for special school purposes.

Recognizing further its obligation to the school and to the architect, the Art Metal Construction Company describes briefly in the following pages a functional application of its products and services to modern desks, tables, bookcases, safes and visible files for the administrative office to special equipment for the library, corridor, laboratory, domestic science rooms, shop, lecture rooms, and storeroom—as an illustration of its wide interests and services.

The services of our consulting staff are available to architects or educational executives who may wish assistance in the planning of school administrative offices, libraries and other departments.

POSTINDEX VISIBLE FILES

- Individual School Census
- School Enrollment
- School Attendance
- Daily Program
- Elementary School Cumulative Records
- Secondary School Cumulative Records
- Combined Elementary and Secondary School Cumulative Records
- Individual Health Records
- Individual Achievement Records
- Teachers Records
- County Financial Accounting Records
- State Education Department Records
- All Kinds of College and University Records

FOR THE ADMINISTRATIVE OFFICE

- Filing Cabinets
  - Letter Files
  - Card Files
  - Counter-Height Files
- Desks
- Office Counters and Tables
- Safes
- Bookcases

FOR THE CLASS ROOM

- Storage Cabinets
- Tables
- Book Shelves
- Blackboard Partitions
- Wardrobe Cabinets

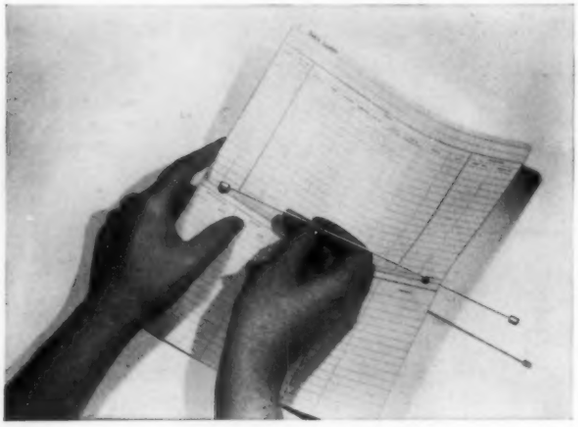
DOMESTIC SCIENCE ROOMS

- Kitchen Cabinets
- Kitchen Drawer and Sink Cabinets
- Kitchen Preparation Tables
- Sewing Tray Cabinets
- Sewing Tray Tables

FOR THE LIBRARY

- Bookcases
- Bookstacks
- Cabinets
  - Filing
  - Storage
- Card Catalog Drawers
- Cards, Record-Keeping
- Counter-Height Files
- Desks
- Doors—Metal
- Glass-door Shelving
- Newspaper Holders
- Newspaper Racks
- Museum Cases
- Shelving
- Tables
- Wardrobes

THE SELF-ALIGNING TRUNNION WIRE MAKES POSTINDEX



Slip It Through the Form

Just "thread" the trunnion wire through the two holes in the four-page form. It's done in a split second — for it's the most natural of actions — and small or large forms are handled equally fast

Snap It in Place

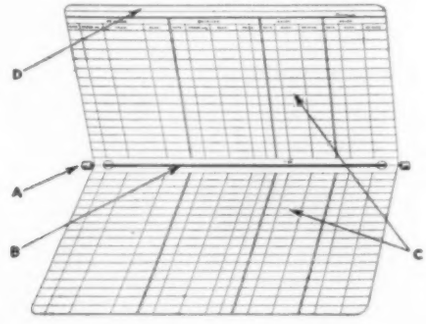
Engage the trunnion under the channel ledge. Then, bending the wire slightly — it's oil tempered steel for the purpose — snap the other trunnion in place. It's all done with the proverbial "twist of the wrist"

POSTINDEX FOUR-PAGE FORM

The Postindex four-page form is ideally adapted to many of the various school accounting records because of the great amount of recording space provided. For instance, it makes possible on one form a complete cumulative student record covering scholastic record, attendance, extra curricular activities, intelligence tests, achievement tests and such other related data, so that it is possible for the school administrator to have complete information at hand in connection with child guidance.

All four pages of such a card are independently accessible for posting and reference as the card lies in the file, making it easy to turn to any section of the record desired.

The spring wire and trunnion card-holder provides an ideal means of attaching auxiliary records to the master form in such a way that essential additional information may be had all in the same place about the same subject or student. See Postindex regular catalog for many other features.



THE SIMPLICITY OF THE POSTINDEX VISIBLE FILE PRINCIPLE

A. This is the trunnion that operates in the channel at the side of the panel.

B. This is the anti-rust tempered spring wire card holder. Form may be inserted or removed from panel instantly.

C. This shows two pages of the four-page form, which gives a writing area on an 8 x 5 inch form of 160 square inches, equal to a ledger page of 10 x 16 inches.

D. This shows the visible line where are typed the name and address or the subject of the record.

SLIDES INTO TYPEWRITER

Postindex records can be indexed and prepared for use on any standard typewriter. As soon as the form is indexed it is ready for mounting on the trunnion wire as shown in the illustrations, the form being properly slotted for the purpose at the factory. Each form is also properly scored at the factory for even, easy folding. Thus the forms can be indexed as required at any time. No attachment is needed on the typewriter—or on the card—for indexing purposes, nor does any part of the form have to be torn off after indexing.

DOUBLE INDEX PREVENTS ERRORS

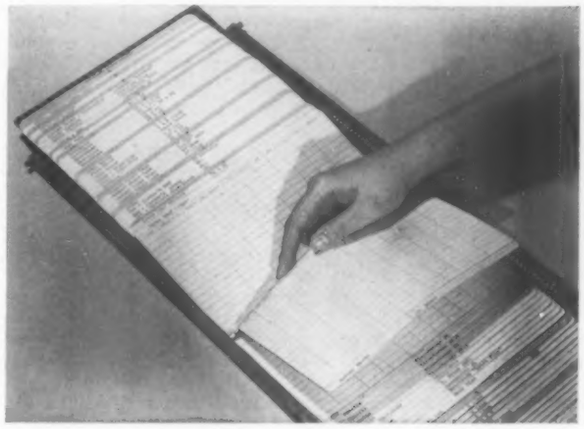
Postindex speeds up the posting, finding and record keeping side of business so tremendously because it is, in itself, such an error-proof system. Thanks to its construction—the hanging of each form from an individual trunnion wire—it is possible to index each four-page form from both front and back. In this way, the index is always visible whether the forms are in the down or upstanding position. This advantage of equally simple "two way" operation is a very real one. As shown by the three positions of the four-page form here illustrated, every part of the record is equally easy to work on, to find or to post. The correct index always in sight safeguards against errors and the time lost in correcting them.

The double index, with 100% visibility at all times, is another important factor in making Postindex the fastest of posting systems. The principle of double indexing is carried on through all phases of a Postindex installation. Each four-page form is double indexed—each tray is double indexed—and each folded insert sheet can also be double indexed, which means greater accuracy as well as greater speed.

THE TRUNNION MAKES THE DIFFERENCE

Postindex is simpler — faster — more flexible and more versatile—because of the exclusive Postindex patented Self-Aligning Trunnion Wire. It's so simple in itself—the trunnion—that its importance cannot be overemphasized. It permits Postindex to operate as no other system can operate. For you will only find the trunnion—with the greater speed and simplicity it effects—in Postindex Files.

THE EASIEST SYSTEM TO INSTALL, OPERATE AND MAINTAIN



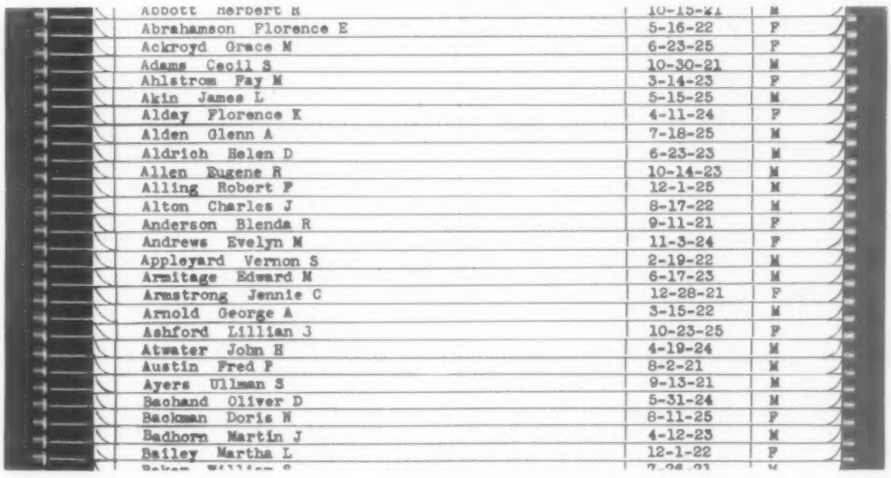
Shift It as You Please

You can remove the units and shift or rearrange them at will. Just pick up the wire, disengaging the trunnion on either side of the channel. And you can shift a handful of forms as easily as a single unit

One Hand Posting
As Only Postindex Gives It to You

Note the perfect lay-back of the forms — because of the trunnion action — which keeps the left hand free for "finding" while the right hand is free for posting

INDEX ALWAYS IN SIGHT AND ALWAYS IN PLACE



Abbott Herbert H	10-15-21	M
Abrahamson Florence E	5-16-22	F
Ackroyd Grace M	6-23-25	F
Adams Cecil S	10-30-21	M
Ahlstrom Fay M	3-14-23	F
Akin James L	5-15-25	M
Alday Florence K	4-11-24	F
Alden Glenn A	7-18-25	M
Aldrich Helen D	6-23-23	M
Allen Eugene R	10-14-23	M
Alling Robert F	12-1-25	M
Alton Charles J	8-17-22	M
Anderson Blenda R	9-11-21	F
Andrews Evelyn M	11-3-24	F
Appleyard Vernon S	2-19-22	M
Armitage Edward M	6-17-23	M
Armstrong Jennie C	12-28-21	F
Arnold George A	3-15-22	M
Ashford Lillian J	10-23-25	F
Atwater John H	4-19-24	M
Austin Fred F	8-2-21	M
Ayers Ullman S	9-13-21	M
Bachand Oliver D	5-31-24	M
Backman Doris N	8-11-25	F
Badhorn Martin J	4-12-23	M
Bailey Martha L	12-1-22	F
Baker William S	7-26-21	M

As this "close-up" view of a Postindex tray shows very clearly, each form unit is held in precisely uniform alignment and "exposure" with all of its neighbors. Here again, the patented trunnion is directly responsible for a highly important Postindex advantage. For a system cannot be a true time saver when it requires constant realignment, adjustment or correction —the kind of attention Postindex does not require.

Note the military precision of the trim-rounded trunnion ends. The shoulder-to-shoulder position of the trunnions makes it impossible for any one form unit to "hide" under the form above or below it. Thus the index line always has 100% visibility—so important for swift fact and figure finding and equally important in posting.

HINGE CLIPS FOR SINGLE CARDS

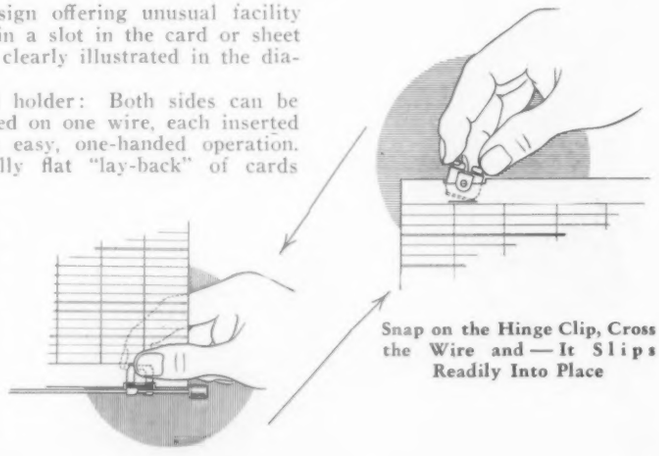
ARTINDEX Hinge Clips are metal tabs of patented design offering unusual facility and freedom of handling. The tongue of the clip engages in a slot in the card or sheet which is thus securely held. The use of the Hinge Clip is clearly illustrated in the diagrams on this page.

Here are some of the many advantages of this new card holder: Both sides can be posted without removal from holder. Two cards can be used on one wire, each inserted and removed independently. Insertion and removal is an easy, one-handed operation. There's no slipping or tearing out of clips. Exceptionally flat "lay-back" of cards either way.

Your present vertical file can be converted, to give you the many advantages of Visible Filing. And give them to you easily and quickly! The Hinge Clip holder makes this change, without even copying old records or new cards. This saves time—saves money—saves material.

Artindex Hinge Clips slip off easily without mutilation of cards or hinges when cards are to be transferred to a vertical file.

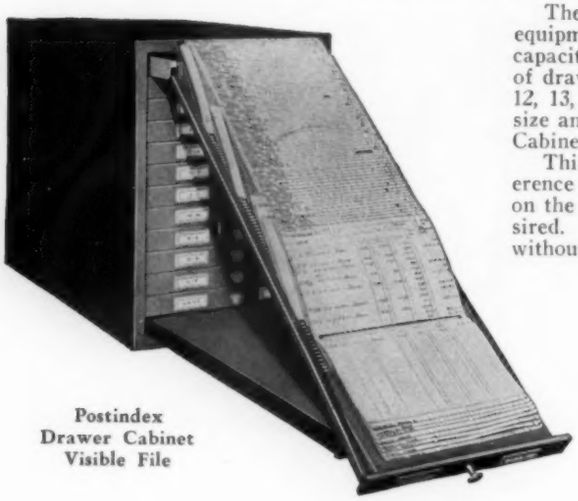
Using the Hinge Clips, the average rate of change-over is a thousand cards a day. Tabs need not cover printing on forms. Ask for a sample Hinge Clip and card, and name the record and quantity you use.



Snap on the Hinge Clip, Cross the Wire and — It Slips Readily Into Place

THE AMERICAN SCHOOL AND UNIVERSITY

POSTINDEX MODEL 8 DRAWER CABINETS



Postindex
Drawer Cabinet
Visible File

The Postindex Drawer Cabinets are generally accepted as standard equipment for many school record requirements. They are available in capacities arranging from 500 to 2,500 records, depending upon the number of drawers and card size selected. Standard cabinets are available in 6, 7, 12, 13, 19 and 20 drawer heights, and a large variety of card sizes. Any size and any capacity may be provided for in the Postindex line of Drawer Cabinets.

This line of Postindex equipment is especially convenient for quick reference purposes since the proper drawer may be quickly located by the index on the front, and as quickly extended for finding of the card or record desired. Postindex is also fastest for posting purposes as posting is done without taking the form out of the file.

This type of equipment gives an unusually fine appearance in offices where attention to such refinement is desired. A single cabinet or a battery of these cabinets may be put on a roller caster stand so the installation may be rolled to different locations in the office, or up along side of a certain desk when particularly desired for prolonged reference or posting.

The trays are quickly removed in case it is desirable to temporarily separate one or several trays from the installation for reference and posting at some other location. The standard trays have on an average of 90 records per tray. This varies slightly one way or the other depending upon the size of the card.

Write for Circular

MODEL 5 FLAT BOOKS AND CABINETS

Model 5 Flat Books are most widely used among school administrators because they are readily adapted to either large or small installations and because of compactness and the convenience in handling. Flat Books are easy to post because they lie flat on the desk. A large number of records are seen at one time as an average Flat Book will hold 140 records. The books furnish a fully protected unit to carry about to any part of the building. They lend themselves ideally to housing in safes when not actually in use. Books may be purchased one at a time to add to present installation. Flat books are made of aluminum and very light to handle.

Write for Circular

POSTINDEX MODEL 1 RAPID STACKS

The Postindex Rapid Stacks are the answer to a situation where it is desired to have each grade or each teacher's record definitely separated from the other records. Each panel in the 5, 10 or 15-panel Rapid Stack has a capacity of 40 to 50 records depending upon the visibility. This is almost always sufficient to cover the number of students in one grade or in one teacher's room.

Where this type of unit is used, the entire set of records is kept in the Principal's office in the Rapid Stack at all times except at the period when it becomes necessary for a teacher to take her panel of records to her own room for posting. This is convenient for both the teacher and the Principal, and eliminates conflictions at times when teachers will be doing posting at the same time, to the student records cards.

The Rapid Stack occupies very little desk room and furnishes quick reference because the panels may be pulled down to any section desired. The unit is light being made principally of aluminum so it can be easily lifted from the desk to a safe for protection.

Write for Circular

SCHOOL AND CHILD ACCOUNTING RECORDS

School administrators, particularly interested in aids to **pupil guidance** and **simplification of work in forwarding transcripts to colleges and universities** and in making reports to local, county, state, and federal officials, will find Postindex the answer to their record problems.

Due to the necessity of having accurate facts for pupil guidance, and the increasing number of reports required by county, state and federal officials on all schools of all kinds, it is imperative that the records of local school systems, colleges, and universities be organized to maintain this information easily, with all facts instantly accessible.

POSTINDEX records make it possible for administrators, supervisors, councilors and teachers to render the services enumerated above in an efficient and confidential manner.

UTILIZING CHILD ACCOUNTING RECORDS

State Departments of Public Instruction and County Superintendents of Schools—Some of the most important areas of use of child accounting records are by state departments of public instruction, county superintendents of schools and local school administrators, dependent upon the prevailing type of administrative organization within a given state, are:

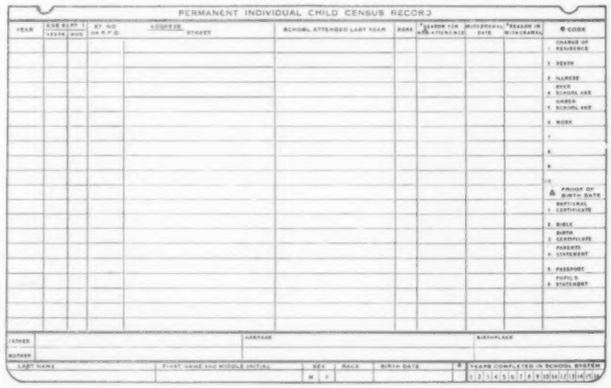
1. Enforcing Compulsory School Attendance Laws. 2. Observing Child Labor Laws. 3. Making Requests for and Apportioning State School Funds. 4. Formulating and Executing Supervisory Programs. 5. Evaluating the Existing Program of Public Education. 6. Administering Textbooks. 7. Making Official Reports. 8. Conducting Research. 9. Planning School Plant Needs. 10. Planning Instructional Staff Needs. 11. Budgetary Procedures. 12. Business Management. 13. Formulating and Executing Public Relations Programs. 14. Determining Tuition Charges for Non-Resident Students. 15. Administering Transportation. 16. Making Administrative Analyses Toward Greater Efficiency and Hence More Functional Opportunities for Children.

In addition to the above enumerated areas of service in which child accounting records are used by state departments of public instruction, county superintendents and local school administrators, these offices also find it imperative to keep certain basic information on teachers in connection with the administration of certification, salary, retirement fund and tenure laws as well as certain records pertaining to school plants and school monies.

SOME ESSENTIAL SCHOOL ACCOUNTING RECORDS

EXHIBIT I

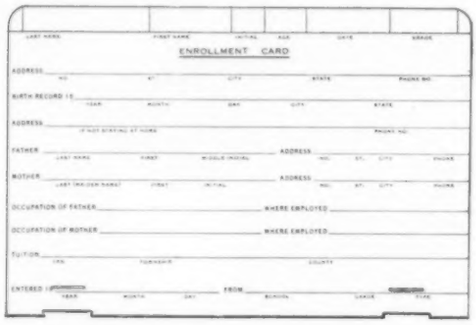
Individual School Census Card—The basic record in accounting for boys and girls by a local school system is the individual school census card, an illustration of which is given in Exhibit I. Such a card as this should be kept for every child from the time of birth at least up to the time he is twenty-one years of age. Attention is called to the fact that the back of the card provides for an employment record which is necessary in the administration of pupil personnel who fall under state labor laws.


PERMANENT INDIVIDUAL CHILD CENSUS RECORD

Postindex form 81-C-6385-8. This shows one side of a two-page card which incorporates complete census information and attendance information. The back side of this card shows history of employment

EXHIBIT II

School Enrollment Card—It is essential that each child be officially enrolled in a school at the beginning of each year. Therefore an enrollment card such as the one shown in Exhibit II is recommended.

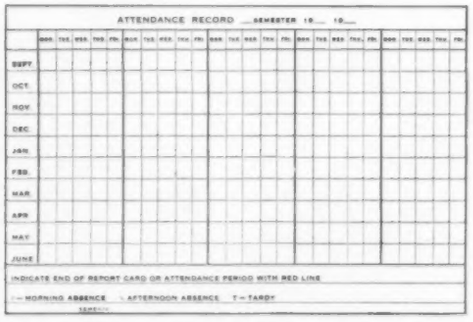


Postindex form 81-B-2916-8P. This is a two-page form with illustration showing the enrollment record. The back side of this same card covers daily program record

EXHIBIT III

KEEPING SCHOOL ATTENDANCE RECORDS

The most satisfactory policy in keeping school attendance records is one under which the individual classroom teacher makes a report to the principal's office soon after the beginning of each half-day session and the principal's office then records the attendance record for each individual pupil on a form such as the one shown in Exhibit III. At the close of each semester or school year a summary of each child's attendance record is transferred to the individual child's cumulative permanent record card and the detailed form is filed as a transitional record.

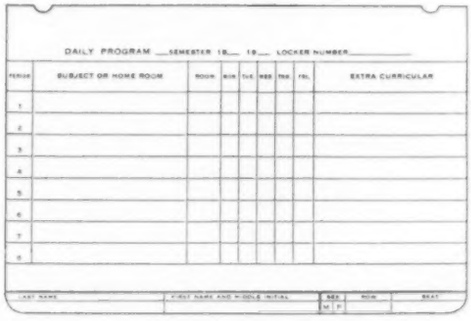


Postindex form 81-B-2922-8. This is an insert form which may be filed with the individual pupil cumulative record. The side illustrated shows attendance record for a year. The back side of this particular form has a daily program record

EXHIBIT NO. IV

INDIVIDUAL CHILD'S DAILY PROGRAM

The Individual Child's Daily Program—In junior and senior high schools and, indeed in all schools having the departmental type of organization, it is essential to have available the daily program of each individual pupil. This is made easy by utilizing the Form shown in Exhibit IV. Here again it has proved desirable to combine the daily program record with either the enrollment record or the attendance record.

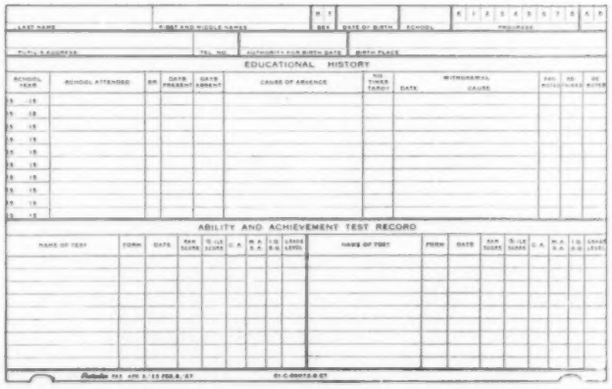


Postindex form 81-B-2913-8. This is a four-page form with illustration showing the daily program for a student. The other pages are devoted to registration information and attendance

EXHIBIT NO. V

ELEMENTARY SCHOOL CUMULATIVE RECORD

The Individual Pupil Cumulative Record—The importance of the individual pupil cumulative record card can scarcely be overemphasized. It is the record which is utilized by all school officials who come in direct contact with boys and girls. The particular form of individual pupil cumulative record card that is kept will depend upon the type of school organiza-



Postindex form 81-C-06072-8CT. This illustration shows one page of a four-page form covering educational history, ability and achievement test record. The other three pages provide for scholarship record and health information

tion. Schools that extend only through the elementary field will obviously have a cumulative record for the elementary period. Six-year secondary schools will provide for the secondary school period, while the schools that provide opportunity for a child from the time he enters school through his graduation from the secondary school will provide a cumulative record for the child's entire school life. Exhibits V, VI, VII

EXHIBIT NO. VI

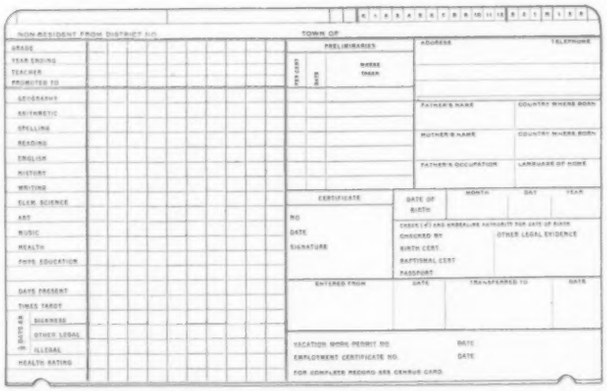
SECONDARY SCHOOL CUMULATIVE RECORD

Postindex form 81-C-05971-8CT. This illustration shows one page of a four-page form with academic record and attendance information. The other three pages provide for general information, extra curricular activities, achievements, with space for intelligence and achievement tests

illustrate an elementary school cumulative record, a secondary school cumulative record and a cumulative record covering both the elementary and secondary school periods.

EXHIBIT NO. VII

SCHOOL CUMULATIVE RECORD



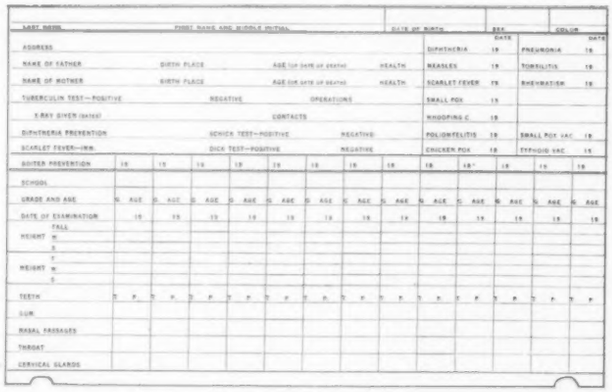
Postindex form C-4077-P. This is a four-page form with illustration showing the elementary scholastic record. One of the other pages covers scholastic record for Junior and Senior High School while the other two pages provide space for recording pupil activities, guidance facts, intelligence and achievement tests

The individual cumulative record card should be kept for each child by the individual class- or homeroom teacher. A cumulative record card for each pupil posted for the period of time a child has attended school should be placed in the hands of each teacher at the time a pupil first comes under his tutelage. Duplicate cumulative record cards ideally should be kept in the offices of the individual building principals and the local chief school executive.

EXHIBIT VIII

INDIVIDUAL HEALTH RECORD

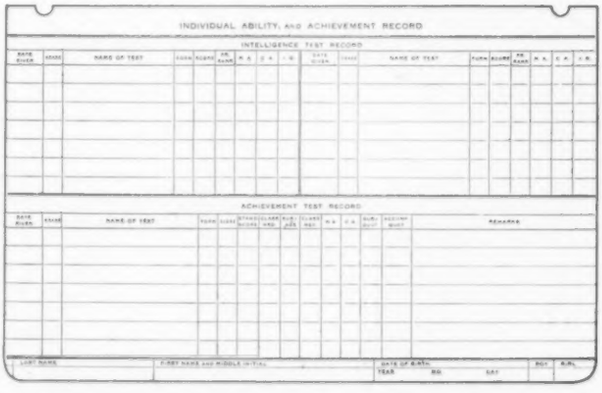
Special Records in School Systems which have the Professional and Clerical Staffs which make such a Practice Possible—It has proven most desirable to keep detailed individual health and achievement records in schools where the staff permits. Illustrations of special records of this type are presented in Exhibits VIII and IX.



Postindex form 81-C-06121-8CT. This is a four-page record with illustration showing a portion of health history. The other three pages are devoted to a continuation of the same record

EXHIBIT IX

INDIVIDUAL ACHIEVEMENT RECORD

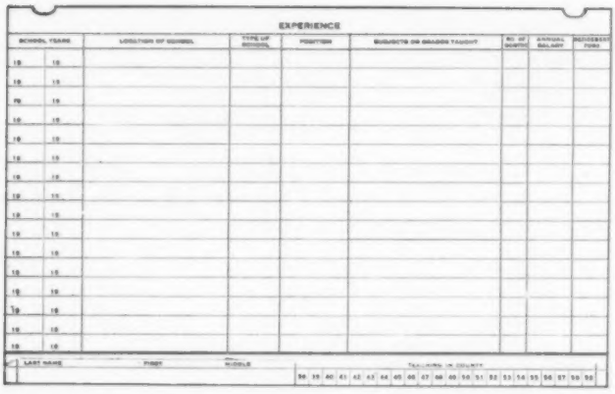


Postindex form 81-C-6387-8. The illustration shows front side covering intelligence tests and achievement tests. The back side is a continuation of achievement tests

EXHIBIT X

TEACHER'S CARD

Exhibit X shows a record of the qualifications and experience of the instructional staff within a local school system.



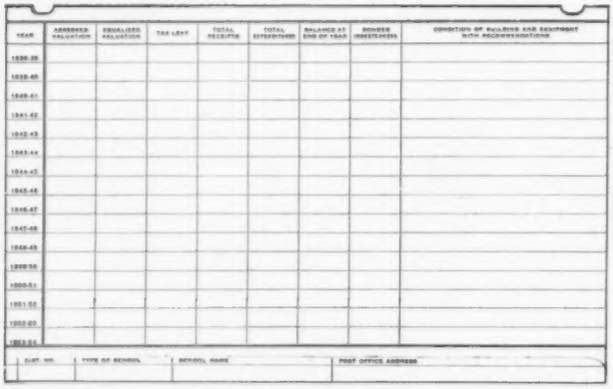
Postindex form 81-C-06112-8CT. This is a four-page record with illustration showing teacher's experience. The other three pages are devoted to personal information, educational background, special training and certification, health and general remarks

EXHIBIT XI

ACCOUNTING BY THE COUNTY SUPERINTENDENT

For each child coming under the jurisdiction of the county superintendent there should be in the county superintendent's office an individual child census card (See page 363) and an individual pupil cumulative record card. (See page 364.) He also may well keep

COUNTY FINANCIAL ACCOUNTING RECORD



Postindex form 81-C-06111-14CT. This is a four-page form with illustration showing financial record. Other pages are devoted to census, enrollment, attendance and information about board members, also State and County financial support

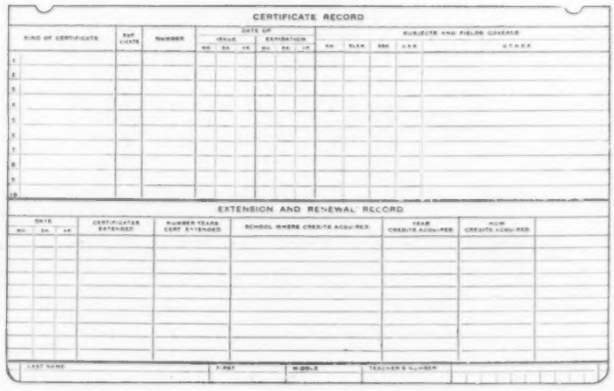
the teacher card illustrated in Exhibit X. In addition there are certain financial and property records that are essential to county administration. Exhibit XI illustrates a card which makes the keeping of such records easy.

EXHIBIT XII

ACCOUNTING BY THE STATE

Exhibits XII and XIII illustrate forms which may well be utilized by the State in connection with personnel and financial accounting.

FLORIDA FORM



Postindex form 81-C-6370-8. This is a four-page form with illustration showing the teacher's certification, extension and renewal record. The other three pages are devoted to experience, training and general information

EXHIBIT XIII

WISCONSIN FORM

Postindex form 96-C-5740-14. This is a four-page form with illustration showing State Aid data. The other three pages provide record in regard to statistical information, census, enrollment and teachers

ART METAL FOR THE ADMINISTRATIVE OFFICE

Vertical Files
"Director" Files for every standard record in units from desk-high to five-drawer sizes. These highest grade files have lifetime ball-bearing roller suspensions and a new, improved side-lock compressor

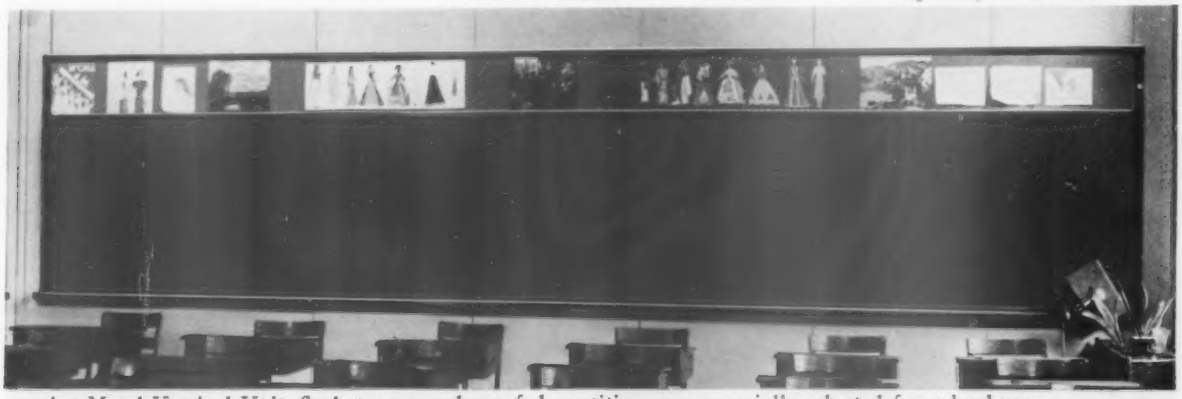
"1500 Line" Desks
Exceptional ruggedness and rigidity and unusual refinements of design are features of Art Metal "1500 Line" Steel Desks, the standard line for general office use. Style 15A60 FB is illustrated

Storage Cabinets
Art Metal Storage Cabinets for all storage purposes come in single and double door widths, also in desk heights and may be had with wardrobe fittings

Fire Safes
Art Metal Fire Safes, available in twenty styles and sizes, preserve valuable records against fire or theft. Tested and approved by the Underwriters' Laboratories

Art Metal Planfiles
The exclusive feature of Art Metal Steel Planfiles consists of compression pockets which hold drawings, tracings, blueprints, in folders—upright, flat and perfectly smooth

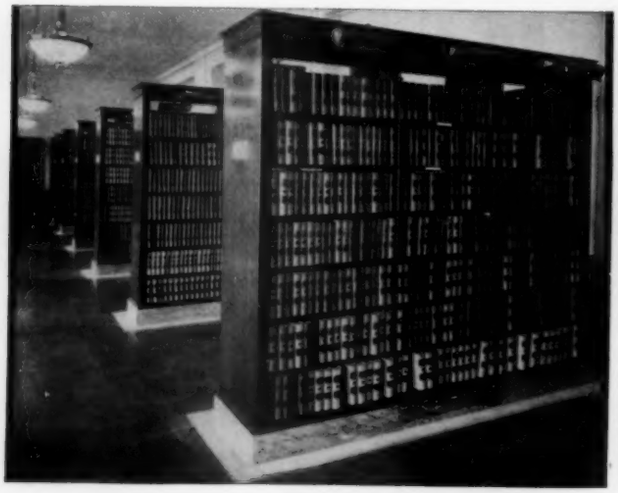
Book Shelf Units
This is the famous Space-A-Shelf unit using the Art Metal library shelf adjustment principle. Detachable end panels are used to save space in batteries of units —especially suitable for schools

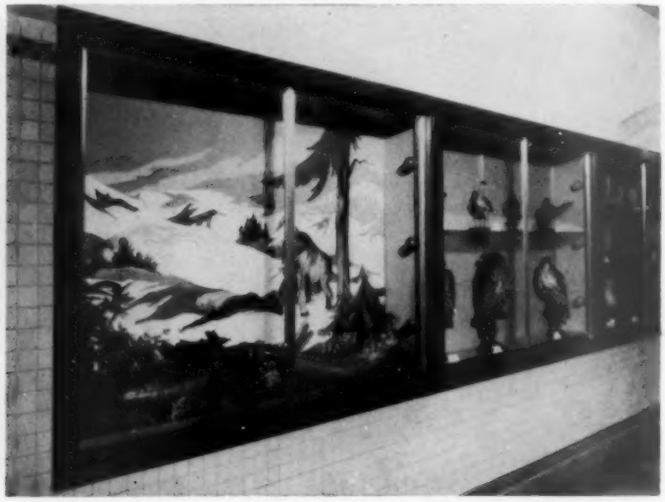


Art Metal Vertical Unit, flush type sound-proofed, partitions are especially adapted for school use.

Modern blackboard equipment demands a frame which is strongly constructed and at the same time of attractive appearance. The accompanying illustration shows Art Metal blackboard frame providing for a corkboard bulletin space immediately above the regular chalk writing space. Catalog on request.

ART METAL FOR THE LIBRARY





BOOKSTACKS

Art Metal Library equipment is used in many schools and universities as well as in a large percentage of the modern libraries in this country. Shown in the accompanying illustration is a series of bookstacks of Art Metal construction. These are the free-standing, two-faced type. Also in popular use is the superimposed self-supporting tier type of stack. In this type bookstack each tier is separated by a deck floor which is supported by the tier or tiers beneath.

MUSEUM CASES

Shown above is a recessed wall case recently installed in a new school building. Cases of this kind are particularly advantageous in displaying educational exhibits. The above case is about twelve feet long and is equipped with semi-indirect lighting which emanates from behind the central pilaster. It has sliding doors. These cases can also be furnished with doors hinged at the top or side and also with panels which are removable.

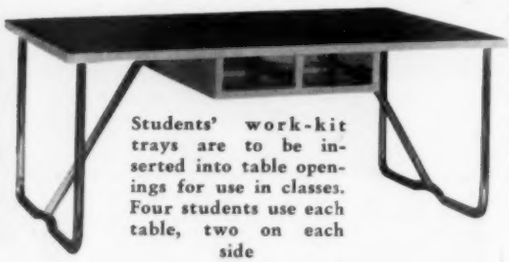
ART METAL FOR THE DOMESTIC SCIENCE ROOM

Art Metal equipment for Domestic Science Rooms includes utensil, storage and undersink cabinets as well as preparation counters, tables and sinks. For Sewing Classes, the individual tray cabinet and work-table provide individual storage and work-space with numbered trays for each student under control of the instructor.

A complete layout service is available to school authorities through their architects or direct in cooperation with architects and contractors.

The domestic science room of the St. Louis Park School, St. Louis Park, Minn., is typical of many Art Metal installations. Architects, Haxby & Bissel.

This Art Metal storage cabinet contains twelve individually numbered trays for use as students' work-kits



Students' work-kit trays are to be inserted into table openings for use in classes. Four students use each table, two on each side

REMINGTON RAND INC.

Buffalo, N. Y.

BRANCHES EVERYWHERE

Triple-Certified SCHOOL RECORD PROTECTION EQUIPMENT

THESE THREE LABELS CERTIFY TO THE PROTECTION ACCORDED BY REMINGTON RAND INSULATED PRODUCTS

SAFE-FILES

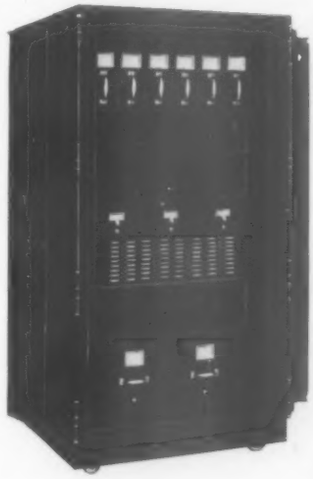
Operating with the ease of a good steel file, SAFE-FILES have the in-built capacity to withstand severe fire (as certified) for a full hour. Their cost is now only slightly more than un-insulated Grade A files! Thick one-piece body insulation supplemented by heavily protected, tongued, grooved and gasketed drawerheads assure the safety of your valuable and vital school papers and student history records which assume such importance for college entrance, civil service qualifications, and multiple other uses.

SAFE-FILE inserts are of two types—substitute drawers and removable trays—either of which may be used in Legal or Letter size SAFE-FILES. Available in 2, 3, and 4 drawer heights and with 5 x 3″, 6 x 4″, and 8 x 5″ Card Tray Inserts.

(Also available is the new SAFE-FILE 30. This unit gives a full 30 minute protection, as certified, against fire.)

OTHER NECESSARY PROTECTION EQUIPMENT

INSULATED VAULT DOORS—single and double, certified with 6, 4, and 2 hour labels. SAFE-LEDGER TRAYS—certified with 2 and 1 hour labels for all standard ledger sheets. DRAWER SAFES—for protection from fire and theft of the school executive's personal records. SAFE-KARDEX—protection against fire and theft of KARDEX Student History Records.



SAFE-CABINETS

Your vital school records need the **certified** safety of SAFE-CABINETS. Don't be lulled to a sense of security because the safe you are now using **looks** strong. Through tests the Safe Manufacturers National Association, and other accredited authorities, have proved that all safes and vaults built prior to 1917 are obsolete and cannot afford adequate fire protection.

Remington Rand SAFE-CABINETS are the result of modern scientific fire resistive findings. They are available with **certified** fire protection ratings of 4, 2, and 1 hours. Many sizes, a wide variety of interiors, and slide-in, space-saving door models mean that you can fit your need exactly.

Time-Tested FILING SYSTEM FOR ALL SCHOOL RECORDS

VARIADEX — FOR FILES OF FROM ONE TO A HUNDRED DRAWERS

INFORMATION FILE—Bulletins from state and national educational associations, report, publication and magazine clippings all contain constructive suggestions and ideas that will help school executives in their planning and policies if they are accessibly filed by VARIADEX.

GENERAL CORRESPONDENCE FILE—Correspondence with business houses, parents, with other schools and state departments should be arranged by name for fast filing and positive, sure-finding by VARIADEX.

PERSONNEL FILE—This file, also, should be under VARIADEX control and contain everything pertaining to the teaching and maintenance staff.

PURCHASING FILE—Purchase orders which are usually arranged to permit finding by vendor's name and order number, and paid invoices and catalogs filed by vendor's names are also most usable when filed by VARIADEX.

Send for your free copy of "School Records and Equipment." A 24-page, illustrated booklet that you will find very helpful.

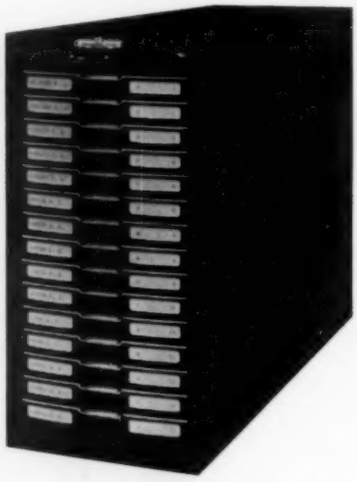
NOW EDUCATION JOINS BUSINESS IN SAYING
O.K., its from Remington Rand

● VARIADEX—Variadex filing derives its name from the ease with which the smaller subdivisions of the alphabet may be expanded into larger ones as filed material increases in volume. It includes a new principle of filing accuracy—color selectivity, which sets up a double check against filing errors by name and color.

For a one-drawer file or a one-hundred-drawer file Variadex will be found best suited for its flexibility, speed, and accuracy. Available in large and small alphabetic divisions.

Efficient ADMINISTRATIVE SCHOOL SYSTEMS AND EQUIPMENT

MODERN KARDEX CABINETS

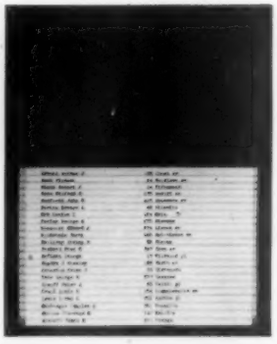


Modern Kardex Cabinets are available in a wide variety of sizes to meet individual requirements. The use of colored signals within the protected-tip, visible card margin materially enhances the speed, accuracy and value of all Kardex records.

Sliding trays operate easily and when extended, provide a flat, even posting position. Pockets will maintain one or more related forms in any standard size.

A safety-door locks automatically when lowered and gives protection against dust and prying.

KARDEX BOOK UNITS



The Kardex Book Unit is Kardex visible record control in its most compact, most portable form. For many teacher's and principal's records they are without peer. Their small size permits carrying anywhere—home, about the school, and when not in use they can be kept at hand in desk, file, or table drawer.

America's second largest city—Chicago, uses 16,000 Kardex Book Units alone for each teacher's grade records.

BUDGET CONTROL CARDS

These cards can be used by Board of Education Officials, School Superintendents, Principals, and Department Heads. Colored progressive signal flashes amounts and percentages of budget expenditures. Current records on the front and last year's on the back.

STOCK CONTROL CARDS

Card set-up allows for complete history of stock movement. Date received, quantity, date issued, amount, and balance left in stock. Visible signals disclose when minimum or re-order point is reached. Intelligent replenishment is controlled and unnecessary delays averted.

Nine Kardex cards standardized as basic school records are: Census Record, Marks and Attendance, Location by Period, Location by Hours, Teacher Location, Room Capacity, Athletic Record, Health Record, and Physical Education Record. Samples are yours for the asking. Write today.

NOW EDUCATION JOINS BUSINESS IN SAYING
O.K., its from Remington Rand

THE AMERICAN SCHOOL AND UNIVERSITY

FLOOR MODEL KARDEX

Available in 8″ form width, all practical form heights

These units have all the advantages of Kardex, plus the added feature of mobility. Here is new convenience and new accessibility in Kardex Visible Records.

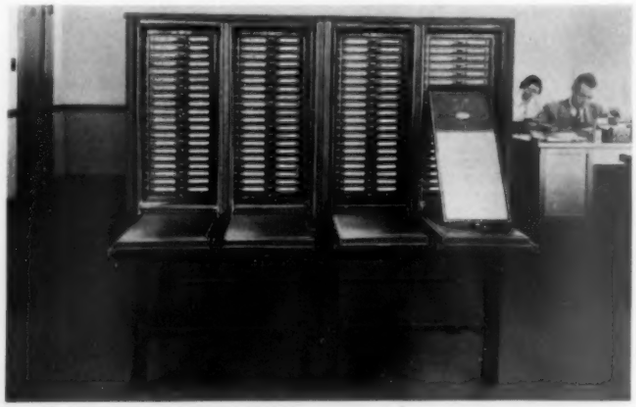
Each unit contains nineteen "slides." A slight pressure on the ejector button raises the slide to the posting position. Each unit is fitted with an accessory tray at the rear. Four ball-bearing, swivel casters glide the unit smoothly and swiftly. "Krinkle black" finish with chromium plated hardware add eye-appeal.

The use of signals within the protected-tip, visible card margin is equally feasible.

STUDENT HISTORY CARDS

Kardex Student History Record Cards give, quickly and accurately, the complete school history of every student. What students are falling behind in their classes, those who need extra help, or merit promotion. Kardex reveals those in need of medical attention, the "I.Q" of every student; from first grade through Senior High.

The importance of this record cannot be over-estimated. Ex-students find these records invaluable as civil service qualifications and college entrance requirements. Unquestionably, they deserve the protection of Safe-Kardex while active records, and Safe-Files when inactive.



Safe-Kardex protects from fire and theft the Student History Records at the famous University of California at Los Angeles.

"LIBRARY BUREAU" LIBRARY EQUIPMENT

BOOK SHELVING

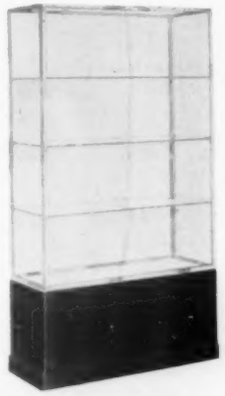
For more than a quarter of a century Library Bureau unit wood book shelving has given continuous and satisfactory service. Shelving, either five or seven shelves in height, 3′ wide on centers, allows for a wide interchangeability of shelves. Shelves are three depths: 8″, 10″, and 12″, and adjustable in height. As wood shelving can be furnished to match the trim of the room, it is generally preferred. Steel bookstacks can be furnished when desired.

LIBRARY TABLES

The beauty of a Library Bureau table is in the selection of wood, the finish, and the graceful proportions. Tops are built up of five-ply construction with a special process that insures against cracking, warping, or splitting. All edges are rounded to prevent slivering or splintering. Special sizes or designs are made to order.

CATALOG CASES

Whether the need be for a single case or a whole battery of units, Library Bureau Catalog Cases are the most satisfactory, because of their compactness and ease of operation. Trays are extremely rigid and strong without excessive weight for handling. Accuracy of construction provides for interchangeability of trays. All trays are equipped with positive followers, and with rods. A typical example is the model No. 23360-R shown above. Unit card catalog cases in five, ten, and 15-tray sections allow for expansion and still maintain the appearance of a single cabinet.



CHARGING DESK

A charging desk scientifically planned and well constructed affords permanent satisfaction. Library Bureau desks in either counter or sitting height are all designed to house the materials used in charging and discharging with proper arrangement to provide maximum convenience for both patron and attendant. Special desks for unusual requirements are made to order.

ADJUSTABLE MAGAZINE RACK

A magazine rack that is different, providing a new method of housing magazines alphabetically in an orderly manner—easy to find—easy to replace. It accommodates 35 magazines. Label holder at the top of each holder identifies the magazine and insures proper replacement.

REMINGTON RAND TROPHY CASES

The Remington Rand Trophy Case can be had in either aluminum or bronze. Narrow frames provide a maximum display space, yet do not detract from the beauty of the surroundings. Cases may be provided with light fixtures to afford proper illumination of contents. The typical case illustrated has glass on ends, top, front and has adjustable plate glass shelves. The front is hinged to allow for access.

Full sweep of complete Remington Rand Library Equipment servicing the library of Brooklyn Technical High School, Brooklyn, N. Y.

Standard Library equipment is carried in stock in quarter-sawed white oak and white maple. Equipment of other woods or of special designs may be furnished on request. For more detailed information in regard to construction or dimensions, send for catalog.

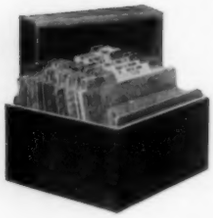
REMINGTON RAND INC. ADDITIONAL LIBRARY EQUIPMENT AND SUPPLIES

- Steel Book Shelves
- Section Label Holders
- Unit Shelving Combinations
- Book Cases
- Office Desks
- Round Library Tables
- Sloping Top Tables
- Library Chairs
- Card Catalog Cabinets
- Information Files
- Newspaper Racks
- Dictionary Stands
- Bulletin Boards
- Book Trucks
- Waste Baskets
- Exhibition Equipment
- Wardrobe and Supply Cabinets
- Overdue Postcards
- Non-Loseable Book Supports
- Poster Holders
- Date Slips
- School Signature Record
- L. B. Paste
- X-L Lock Binders
- New Thrift Pockets
- Accession Books
- Application Cards
- Charging Trays
- Charging System Guides
- Periodical Record Cards
- Vertical and Visible Filing Supplies
- Mending Tools and Materials
- Rubber Dates

NOW EDUCATION JOINS BUSINESS IN SAYING
O.K., its from Remington Rand

COMMERCIAL CLASSROOM EQUIPMENT

PRACTICE FILING OUTFITS



Remington Rand's Library Bureau Practice Method of Teaching Filing is unique in that it brings the student into direct contact with actual filing work. "Learning by doing" is the guiding principle of this new plan of learning to file. Students of this course first familiarize themselves with the essential rules of indexing. Then they apply these rules by becoming "file clerks" in a fictitious New York City company. They file miniature correspondence in miniature folders behind miniature guides. Thereby, learning to master the intricacies of the various forms of filing.

PROGRESSIVE INDEXING AND FILING TEACHERS' KEY AND TEACHERS' GUIDE

Written in a clear, comprehensive manner, "Progressive Indexing and Filing" furnishes an outline and supplementary material for the practice course in filing. Carefully planned, progressive steps, from elementary essentials to the more advanced phases of filing, aid the teacher who conducts the course. Pertinent questions at the end of each chapter suggest points for class discussion and recitation.

Supplementing this text are a Teachers' Key and Teachers' Guide. Both booklets serve as an aid in presenting the subject of filing. They also assist in checking and measuring the work which the students perform with the practice outfits.

Students working on Vertical Practice Filing Outfits, Commercial High School, Atlanta, Ga.

VISIBLE RECORD OUTFITS

New Remington Rand practice method is designed to acquaint students with the fundamentals of visible record control. Each pupil works with a model visible system, sets up the record, makes entries, establishes a visible signal control and draws conclusions from the posted facts. A full-sized 6-tray Kardex Cabinet is furnished. Five of the slides are fitted with cards illustrating personnel, prospect, stock, ledger and sales records. The sixth slide has Kardex pockets only. Teacher's task made easy by following authoritative textbooks and guides. Schools purchasing a complete set of visible record equipment are entitled to a free correspondence course and Question and Answer service.

ALPHABETIC INDEXING AND FILING WORK BOOK

A new Work Book supplements the textbook, "Progressive Indexing and Filing." Contains definite rules and standard practice instructions conducive to simplified filing methods observed in business offices. Material written in clear, thorough manner, easy for students to absorb. Over 100 job lessons carry students through all phases of indexing and filing. Large quantity of perforated sheets follow job assignments. Each sheet in turn perforated to make six filing slips. Slips can be used as cards.

REMINGTON RAND CLASSROOM PRODUCTS

Textbooks on Visible Record Keeping

Textbooks on Filing

Practice Equipment for Teaching Filing

Demonstration Material for Office Practice

Bookkeeping Instruction Equipment

NOW EDUCATION JOINS BUSINESS IN SAYING
O.K., its from Remington Rand

SIGHT CONSERVATION EQUIPMENT

TYPEWRITERS WITH LARGE TYPE NOW USED BY PROGRESSIVE SCHOOL SYSTEMS IN SIGHT CONSERVATION CLASSES FOR CHILD EDUCATION IN PRIMARY AND ELEMENTARY GRADES FROM COAST TO COAST.

EMINENT EDUCATORS ENDORSE LARGE TYPE MACHINES AS ESSENTIAL TO PROGRESS OF THOUSANDS OF PUPILS IN LOWER GRADES WITH POORLY DEVELOPED EYESIGHT.

"WORK IS BROUGHT CLOSER TO STUDENTS WITHOUT EYE-STRAIN."

MACHINES ALSO USEFUL FOR PREPARATION OF BULLETINS, PROGRAMS, TEST PAPERS, MENUS, SEAT WORK, AND KINDERGARTEN ACTIVITIES.

Remington Large Primer Type No. 47

Letter Spacing - Eight to the inch

LARGER PRIMER . . . especially well adapted for kindergarten use, first and second grades. Equally effective for pupils in intermediate grades who have subnormal vision. Dr. Thomas D. Wood of Columbia University states that, "Approximately 3,000,000 children in the United States, one eighth of the entire school population, are handicapped in their education by defective eyesight."

No. 17 Remington Standard Typewriter

Remington Magnatype No.105

Letter Spacing 6 to inch

MAGNATYPE . . . the all-around type, endorsed by the National Society for Prevention of Blindness, for general use. Cuts better stencils, and is much in demand by teachers. Over 150 large-type machines are used in the 92 sight conservation classes in New York City.

No. 5 Remington Streamlined Portable Typewriter

This is Double Case Bulletin Type excellent for bulletins and notices.

BULLETIN . . . as shown, Bulletin is well suited for making bulletins and notices. Excellent for work copies. Work is much more legible and easily preserved for filing and future reference. Los Angeles schools use over 400 machines equipped with these large type styles.

FOR MOVIE TITLES, NEWS BULLETINS, & SIMILAR WORK.

LARGE BULLETIN . . . preferred where messages must be read from distances, such as movie titles, screen slides, and posted bulletins. Used in extremely substandard cases.

NOW EDUCATION JOINS BUSINESS IN SAYING
O.K., its from Remington Rand

We are glad to be here.
We are glad to be here.

Ww ane glad to be here.
We are glad to be here.

Martha Jane Watson
Age 7

juyj jmnj jmnj kik
dedcd swsxs aqazza
lol.l ;p;/; frtf f
jhfg kik,? jjjjjj

Once there was

Alice. She lived

Near the house was

where Alice played.

Characteristic of the work accomplished in the Primary and Elementary grades are these two specimens (one shown only in part) of seat work typed by two first grade pupils. The touch method of typing was used exclusively. Emphasis was placed on accuracy and neatness. Students had normal eyesight.

Remington Rand typewriters, No. 17 and Portable models, are equipped with large sized type. Magnatype 105 and Bulletin type 48 are endorsed for Sight Conservation by the National Society for Prevention of Blindness. Primer types are recommended for general use. Type obtainable in either double or single case letters. Both the Model 17 and the Portable operate smoothly and quietly. A child in kindergarten can operate either with a minimum of effort. Durably built to stand hard abuse. All known typewriter improvements make these machines essential to any curriculum having to do with typing or Sight Conservation. Further details furnished on request.

Primary grade pupils doing seat work with Remington Portable typewriters

BOOKKEEPING, ADDING AND ACCOUNTING MACHINES

FOR THE ADMINISTRATIVE OFFICE

Fast figures—correct figures—economical figures—are as essential to modern school administration as they are to modern industry. Remington Rand serves both fields with the world's most complete line of accounting machines.

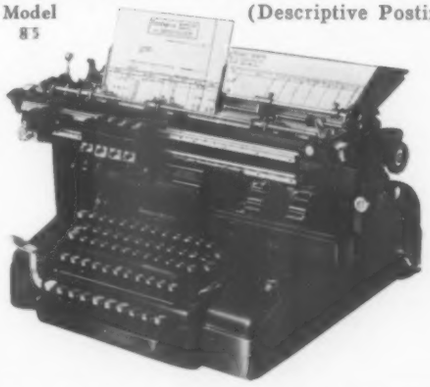
Budget accounting—financial control—purchase and expense distribution—investment ledgers for endowment funds—employees' and instructors' earning record and payroll register—tuition and term bills—these are but a few of the time and money-saving applications of the Model 85 Completely Electrified Bookkeeping Machine, shown below. Hundreds of these machines are today speeding the flow of figures and cutting bookkeeping costs in school and university offices throughout the country.

FOR THE COMMERCIAL CLASSROOM

Modern accounting and bookkeeping education requires thorough training in practices and methods which the student will encounter in business life. Because thousands of business firms in hundreds of industries depend on Remington Rand Accounting and Bookkeeping machines for rapid, accurate figure-work, every school commercial department, to train students completely, requires the fundamental Remington Rand business machines shown on this page.

CROSS-COMPUTING BOOKKEEPING MACHINE

Model 85 **(Descriptive Posting)**



Model 85 provides extra speed, extra bookkeeping economies through complete electrification of all numeral and alphabet keys, of carriage return, of automatic tabulation from column to column. All vertical-registers are equipped with direct subtraction, providing contra-entries within specific columns, and instant correction of errors. Mechanical proof of clearance and positive identification are secured in the cross-computing registers. Quickly and easily adapted, Model 85 is now being used by over 450 different types of companies, in more than 1500 different applications.

STATEMENT AND LEDGER MACHINE

Model 890-J **(Posting Speed)**

The completely electrified Dual Printing Model 890-J posts statement, ledger and proof-journal in a single 10-second operation. Only one hand is needed to operate the electrified, 10-key keyboard. All computation is done by the machine itself. Balances are automatically computed and printed as needed—credit balances are automatically printed in red. All records are originals, printed simultaneously. The proof-journal provides not only visual audit of each item as posted, but also an automatic mechanical proof of the correct entry of all debits, credits, previous balances.

ELECTRIC PORTABLE ADDING MACHINE

Model 9381-5

The most completely electrified adding machine available today. Adds up to one million dollars, lists eight columns with simplified, 10-key keyboard. Direct subtraction, direct multiplication are major features. Provides sub-totals, totals, corrections, non-add listings — electrically. Light — compact (8″ x 14¾″). This is but one model in the complete line of Remington Rand Adding Machines. Other models available with or without direct subtraction, hand or electrically operated, with 5″ or 13″ carriage.

REMINGTON RAND COMPUTING AND LISTING MACHINES

ACCOUNTING MACHINES
ADDING MACHINES
BOOKKEEPING MACHINES
CALCULATORS
CASH REGISTERS
CONTINUOUS FORM MACHINES

NOW EDUCATION JOINS BUSINESS IN SAYING
O.K., its from Remington Rand

Typical of Remington Rand mechanical accounting service to the educational institutions of America.

1880 **YAWMAN AND ERBE MFG. CO.** 1939

Executive Offices and Factories: Rochester, N. Y.

BRANCHES OR DEALERS EVERYWHERE

Steel Desks and Files, Safes,
Storage Cupboards and Shelving
Bank, Hospital and School Equipment
Filing Methods and Supplies
Visible Card Record Equipment

"Y and E"

Cards, Card Guides,
Vertical Filing Guides and Folders,
Red Rope Pockets and Wallets,
Visible Card Record Systems

"FOREMOST FOR MORE THAN FIFTY YEARS"

FULL SIZE CLASS ROOM EQUIPMENT FOR TEACHING INDEXING AND FILING

Steel File
Complete outfit for 40 period Course

High Schools, Junior Colleges and Private Commercial Schools are paying much attention to the teaching of Indexing and Filing. Teaching this subject is much the same as teaching Typing or the use of Accounting Machines. The student must actually use the files. The method of teaching the care of records, without the records themselves and equipment for arranging and housing them, is just as absurd as it is to think of teaching Typewriting without the aid of a typewriter or Machine Bookkeeping without the aid of a machine.

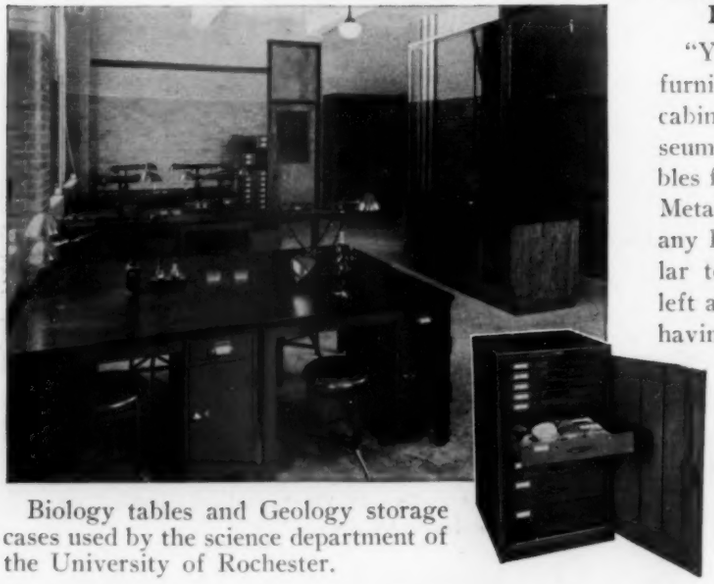
The Study of Indexing (Classification) and Filing (Orderly Arrangement) is highly educational and not mechanical. Commercial Laboratory Courses are crowded to various degrees. Hence it is necessary to arrange courses of various lengths. The chart to the right lists the complete teaching program, showing what subjects can be adequately covered in courses ranging from 20 to 80 forty-five minute classroom periods.

Program of Subjects for Courses of Various Lengths	Number of Periods Assigned to Each Subject for Various Length Courses			
	20	40	60	80
Introduction	1	1	1	1
Gen. Rules for Alphabetic Indexing	3	3	4	5
Historical Development of Filing Methods	1	1	1	2
Indexing and Filing Routine	3	3	4	5
Correspondence Filing System Supplies	2	2	3	4
Alphabetic Indexing and Filing	3	5	5	5 Test
Alphabetic Correspondence Filing Systems	3	5 Test	6 Test	7
Duplex Name Alphabetic Indexing		2	3	4
Numeric Correspondence Filing		4	4	5
Filing Special Records		1	2	4 Test
Geographic Correspondence Filing		4	4	5
Subject or Data Filing			4	5
Charge Systems	1	2	3	4
Follow-Up Systems	1	2	2 Test	3
Transfer Methods	1	1	2	3 Test
Planning Card Record Systems		1	2	2
Development of Card Indexes			2	3
Typical Card Record Systems			1	2
Modern Filing Equipment		1	1	3
Special Equipment, Accessories			2	2
The Central File Department			1	2
Test	Test	Test	Test	Test
	20	40	60	80

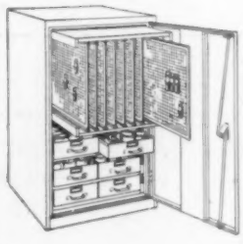
Send for sample pages, instructors guide and complete information on courses for instructors and certificates for students finishing any course.

LABORATORY AND STORAGE EQUIPMENT

FOR SCIENCE HALLS AND MUSEUMS



Biology tables and Geology storage cases used by the science department of the University of Rochester.



"Y and E" is equipped to furnish you with steel storage cabinets, herbarium and museum cases, and laboratory tables for your Biology, Geology, Metallurgy, Physics, and Botany Departments. Cases similar to those at the right and left are made with stock shells having special interiors for the storage of biological and geological specimens.

Our consulting service department will be glad to work with you in designing the type of equipment which is best suited to your requirements. For recommendations, suggestions and bids write Chas. W. Ward, Sales Engineering Department.

ALL-STEEL-EQUIP COMPANY, INC.

551 Griffith Ave.
Aurora, Illinois
New York, N. Y., 56-58 W. 22nd St.
Chicago, Ill., 326 S. Jefferson St.
Detroit, Mich., 311 Donovan Bldg.
BRANCHES AND SALES OFFICES IN PRINCIPAL CITIES

WRITE FOR LATEST CATALOG OF SCHOOL EQUIPMENT

A-S-E MODERN LOCKERS

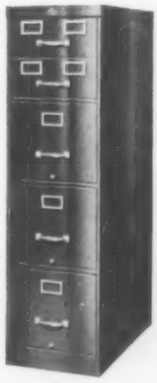
Smoothness, strength, simplicity of design characterize the All-Steel-Equip locker for 1939. Utility and beauty are cleverly combined; the distinctive one piece handle—finished in Satin Chrome—is tamperproof, will not become loosened, and incorporates an unobtrusive padlock strike that keeps padlock from marring finish of door front. Hinges are constructed to be smooth in appearance, jimmy-proof, non-sagging in operation. Louvers are designed in the modern manner.

A-S-E lockers are built in single tier, double tier, box and combination models—for all storage needs. Ruggedly built to give years of service.

Finished in Olive Green baked-on enamel, French Gray, School Furniture Brown. Other colors to order.

Send for Catalog No. C-31 for more information.

A-S-E FILING CABINETS



There is a practical, economical A-S-E File for every filing need—numerous drawer arrangements and sizes to meet each individual requirement—and prices to fit your budget.

In A-S-E **Balanced Design** Filing Equipment every feature is on a quality par with every other construction detail. A-S-E Aurora Files contain many **plus** values: FULL 28" DEPTH, durable baked-on enamel finish in grained wood or flat colors; heavy six-post steel frame; smooth drawer operation; side-locking compressor, dust-proof enclosed bottom, solid bronze hardware. Write for complete information. Catalog F-10.

A-S-E STEEL DESKS

A-S-E Aurora desks, tables and stands are built of highest grade furniture steel. They are given extra strength and stability by the proved construction principles which are followed in their manufacture. They afford maximum comfort and convenience for the user. There is a type for every office need. A-S-E Aurora equipment is widely known for workmanship, appearance and durability. Complete details contained in Catalog D-10—send for it today.

A-S-E TEACHER-CONTROL WALL-ROBES

The A-S-E Wall-Robe for 1939—just 60" high overall—is the only steel elementary school wardrobe offering top shelf accessibility for even the smallest children. Individual door operation but one-point lock control. Each single unit in the group can accommodate as many as six pupils; Wall-Robes may be recessed in walls of new buildings or set up, free standing, in remodeled buildings. Tremendous saving in space can be effected by their use.

Handles, hinges and louvers are the same design as those on A-S-E locker and finishes are the same. Write for Bulletin No. WR-1.

A-S-E STEEL CABINETS

A line of fifty-seven models of strong steel cabinets with single or double doors, adjustable shelves, grooved key disc tumbler lock, smart vault type hardware, offers a unit for any particular school need. Standard finish is Olive Green, but Walnut, Mahogany, grained Oak or French Gray may be furnished upon specification. Ask for Catalog No. 176.

A-S-E PATRICIAN SHELVING

Beautifully finished steel bookshelving. Shelves quickly adjustable without use of tools. 36" wide sections may be used as single units or in batteries. Easily erected, easily moved.

BEHIND THE A-S-E TRADE-MARK

There is over a quarter of a century of experience in the design and manufacture of A-S-E steel lockers, steel book shelving, steel storage, filing, card, wardrobe cabinets, steel transfer cases, steel desks, tables, typewriter stands and steel shop equipment. High quality is maintained and complete satisfaction is assured.

A-S-E maintains a staff of experienced engineers whose services are available, without obligation, for consulting and designing. Their suggestions have been especially valuable in connection with the choice of the proper type of locker to meet each requirement and in suggesting the most practical solution to the placement problem. Branch offices provide prompt and accurate supervision.

BERGER MANUFACTURING DIVISION

OFFICES IN PRINCIPAL CITIES
Birmingham
Boston
Buffalo
Chicago
Cincinnati
Cleveland
Columbus
Dallas
Detroit
Indianapolis

REPUBLIC STEEL CORPORATION

Canton, Ohio

OFFICES IN PRINCIPAL CITIES
Kansas City
Los Angeles
Minneapolis
New York
Philadelphia
Pittsburgh
San Francisco
St. Louis
Toledo

STEEL LOCKERS—ALL TYPES
STORAGE CABINETS
FILING CABINETS
DESKS AND TABLES
STEEL SHELVING
LIBRARY EQUIPMENT
BOOK SHELF UNITS
WARDROBES

Complete Line
of Filing Cabinets

BERLOY STEEL EQUIPMENT is manufactured by an organization with more than fifty years' experience in making equipment for the modern school and university. Berloy equipment is built to meet the most rigid requirements for durability, utility, and structural perfection. All items are quickly available in practically every size and type. Experienced Berloy engineers will be sent anywhere without charge to assist architects, builders or purchasing agents in planning new installations.

Teacher's Cabinet
and Storage Cabinet

Steel Lockers
All Types

Steel Book Shelf Units
and Library Stacks

Steel Desks and Tables

Steel Shelving
Many Styles and Sizes

Reg. U. S. Pat. Off.
BERLOY

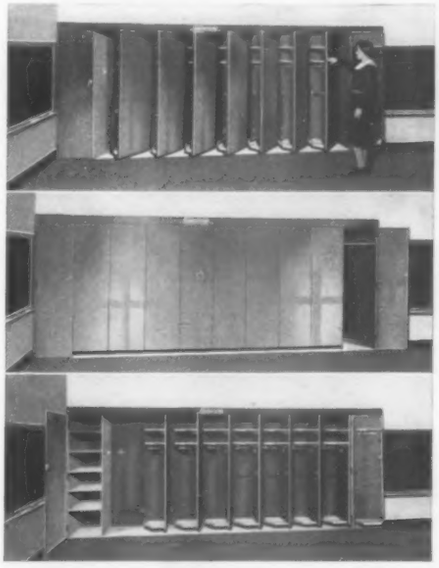
DIEBOLD SAFE & LOCK CO.

Canton, Ohio

BRANCH OFFICES:

NEW YORK
PHILADELPHIA
BOSTON
WASHINGTON
PITTSBURGH
CLEVELAND
DETROIT
CHICAGO
ST. PAUL

THE UNIT CONTROLLED MULTIPLE WARDROBE



The seven student compartments open and close as one unit—easy to operate—no levers or catches to release.

The Eldoorobe is a completely finished unit, compact and pleasing in appearance.

The student wardrobes open flush with the front of the unit providing free access to robe space and no lost aisle space.

The DIEBOLD Eldoorobe, the modern schoolroom locker, will accommodate the garments of forty or more students. It has seven "L" shaped student wardrobes, one teacher's wardrobe, one storage cabinet for books and supplies and one control wardrobe.

The seven student wardrobes can be opened, closed and locked as one unit from the control wardrobe. The operation is entirely noiseless and positive. There is no complicated mechanism to get out of order. The unit is built to last indefinitely.

The Eldoorobe is ventilated thoroughly. Air is drawn into the bottom of the unit, up through the lockers, and out through the perforated top into the standard ventilating stacks of the building.

Eldoorobes can be placed any where in present schoolrooms or recessed into walls of new or remodeled buildings. Write for complete details and specifications.

Wheel Filing Systems Speed Work—Cut Office Costs:

Cardineer and Reveldex Record Systems bring heretofore unthought of economy and efficiency to record processing. All records come to one common position for reference and posting — the desk top, the best lighted position in the office.

Up to 25,000 records can be concentrated at the operator's fingertips . . . to reduce lost motion, operator fatigue and eye-strain and to speed up all record processing.

Flexible Visible Filing Systems:

DIEBOLD Sectional Drawer Visible Files provide unlimited flexibility . . . you buy only what you need and expand, a drawer at a time, as your needs increase.

Forms are instantly removed and easily replaced. New forms are just as easily added in their proper places.

For "charting" or "signaling" activity on groups of records movable signals slipped over the visible margin will provide administrative officers with an accurate, quick picture of the activity on any single record or on a group of records.

Modern Certified Record Protection:

Vital school records that must be preserved are subject to destruction by fire unless housed in modern safes that provide sufficient protection to balance YOUR fire hazard. Modern DIEBOLD Fire Resistive Safes are designed and labeled to provide 1, 2 and 4 hours fire resistance.

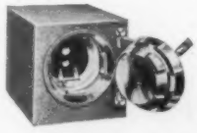
There is a complete range of styles and sizes available. Let the DIEBOLD man measure your fire hazard and recommend the degree of protection you require.

Replace Obsolete 10-Minute Vault Doors:

Modern DIEBOLD Flat Sill Insulated Vault Doors and File Storage Room Doors are scientifically designed and tested to withstand fires of ½, 1, 2, 4 and 6 hours duration.

All DIEBOLD Doors bear labels certifying the degrees of fire protection they are designed to provide. Let us check the protection your present vaults provide and work with your architects on the protection requirements of any new ones to be built.

Reduce Safe Burglary Insurance Rates 70%:



DIEBOLD Cashgard Chests will reduce your Safe Burglary Insurance rates 70% and more . . . and keep on returning these savings long after they have paid for themselves.

Many styles and sizes are available. Chests with inner doors provide both burglary and holdup protection.

Many styles and sizes are available. Chests with inner doors provide both burglary and holdup protection.

DURABILT STEEL LOCKER CO.

529 Arnold Avenue, Aurora, Ill.

SALES OFFICES IN ALL PRINCIPAL CITIES

PRODUCTS

Steel Lockers for all purposes
Steel Storage and Wardrobe Cabinets
Steel Gymnasium Racks and Trucks
Table Tennis Tables and Equipment

LOCKERS

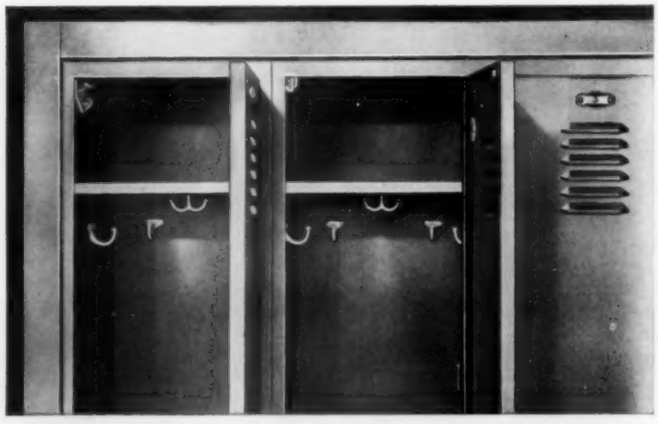
Single Tier Lockers

For clothing storage, the Durabilt Lockers best suited to schools and gymnasiums are the specially equipped full length or Single Tier Lockers either recessed in the walls, on concrete bases, or free standing on legs. Where Single Tier Lockers are not desired, we recommend the use of Double Tier Lockers. Multiple Tier Lockers, or "Box" Lockers are ideally adapted to storage of gym suits, books, sewing materials, etc. Combinations of any of these types, are of course, available.

W. D. H.	Overall Height Including Legs
12x12x60"	66"
12x15x60"	66"
12x18x60"	66"
15x15x60"	66"
15x18x60"	66"
18x21x60"	66"
12x12x72"	78"
12x15x72"	78"
12x18x72"	78"
15x15x72"	78"
15x18x72"	78"
18x18x72"	78"
18x21x72"	78"

Equipment includes hat shelf, one double prong ceiling hook and three or more single prong side hooks, depending on size of locker.

SCHOOL WARDROBES



Durabilt Steel School Wardrobes are ideal for corridor or classroom installation. They give teacher or monitor control of every wardrobe. Can be either single or double door arrangement.

These School Wardrobes are locked by a unit-control group locking device whereby all units in one entire group may be locked from the master locker. This device will lock or unlock all units across the width of a classroom, and is operated from one of the end wardrobes or from the teacher's wardrobe. When the control lever is in the unlocked position, doors on all units open and close independently.

CABINETS

Combination

Storage

For secure, dust-proof, fire-retarding, germ-proof, and orderly storage of books, catalogs, stationery, and office supplies; for wardrobe and thousands of other uses, Durabilt steel cabinets are outstanding. Write for prices and complete information.

FEATURES OF CONSTRUCTION

1. More storage space inside than other cabinets of same size.
2. Heavy gauge steel doors, pan reinforced full length.
3. Shelves adjustable up and down on one inch centers without use of tools.
4. Large steel gliders on four corners of bottom make it easy to move cabinet and prevent damage to floor.

BASKET RACKS AND TRUCKS

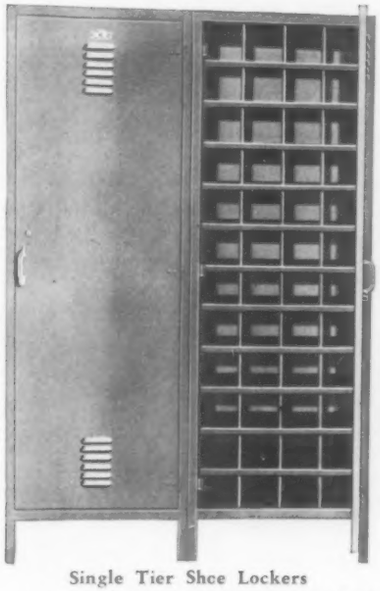
The use of steel racks and wire baskets is often preferred to Multiple Tier (Box) lockers. This system is less expensive and gives the advantages of complete ventilation and makes the contents visible for inspection at any time. The security and orderly appearance of the box lockers is, of course, sacrificed to some extent. The illustration at the left shows the single row, skeleton type, Basket Rack with baskets in place. This rack has a capacity of 30 baskets and consists of steel shelves with angle uprights, basket separators and padlock hasps which permit locking of the baskets in place. The illustration at the right shows the double row Basket Truck, built with solid ends and casters instead of legs, for portability.

OTHER TYPES OF DURABILT STEEL LOCKERS

Double Tier Lockers

W. D. H.	Height Overall Including Legs
12x12x30″	66″
12x12x36″	78″
12x15x36″	78″
15x15x36″	78″
12x15x42″	90″
15x15x42″	90″

Coat hooks same as in Single Tier Lockers. Hat Shelf is omitted in Double Tier Lockers.



Single Tier Shoe Lockers

W. D. H.*	No. of 6″x6″ openings	W. D. H.*	No. of 6″x6″ openings
12x12x60″	20	12x12x72″	24
12x15x60″	20	12x15x72″	24
18x12x60″	30	18x12x72″	36
18x15x60″	30	18x15x72″	36
24x12x60″	40	24x12x72″	48
24x15x60″	40	24x15x72″	48

While 6″x6″ is the accepted size for shoe compartments, other sizes in proper multiples can be furnished.

Multiple Tier Lockers

Lockers High	W. D. H.	Height Overall Including Legs
5	12x12x12″	66″
6	12x12x12″	78″
5	12x15x12″	66″
6	12x15x12″	78″
4	15x15x15″	66″
5	15x15x14⅝″	78″

Hat shelf and coat hooks are omitted in Multiple Tier (Box) Lockers.

Two Person Lockers

W. D. H.*	W. D. H.*
15x12x60″	15x15x72″
15x15x60″	15x18x72″
15x18x60″	15x21x72″
15x12x72″	

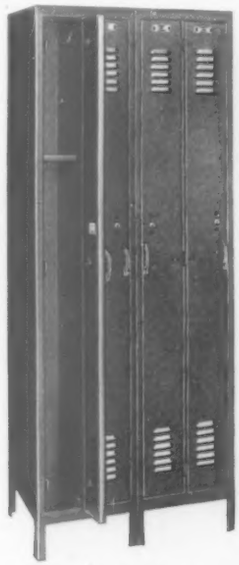
Equipment consists of two hat shelves, vertical partition dividing lower part into two coat compartments each having one double prong ceiling and two or more single prong side hooks, depending on size of locker. Can be furnished without partition when desired.

Two-in-one Lockers

W. D. H.*	
15x15x72″	without coat rod
15x18x72″	with coat rod
15x21x72″	with coat rod

Coat compartments are 7½″ wide x 54″ high. Hat compartments are 15″ wide x 9″ high, making total height of section 72″ *exclusive of legs.*

Equipment—One double prong ceiling hook and two or more single prong side hooks, depending on size of locker. Lockers 18″ deep and over have a coat rod in addition to hook equipment.



Duplex Lockers

W. D. H.*
15x15x72″
15x18x72″
15x21x72″

Two lockers in special 15″ wide frame. Each locker 7½″ wide. Provides 2835 cu. in. capacity in 18″ deep locker.

Equipment—1 hat shelf spaced 21″ down from top, one single prong coat hook above shelf; one double prong ceiling hook bolted to shelf and 2 or more single prong hooks below shelf. Coat rods can also be furnished. Requires only 2 locks. Very economical and conserves floor space.

*Overall height, including legs, is 6 ins. greater.

THE GENERAL FIREPROOFING COMPANY

Youngstown, Ohio

BRANCHES
BOSTON—714 Beacon Street
CHICAGO—36 S. State Street
CLEVELAND—1235-37 Prospect Street
HARTFORD—8 Ford Street
LOS ANGELES—1733-35 So. Los Angeles Street
MINNEAPOLIS—310 N. First Street

BRANCHES
NEWARK—17 Academy Street
NEW YORK—500 Fifth Avenue
PHILADELPHIA—2301 Chestnut Street
PITTSBURGH—642 Grant Street
ST. LOUIS—521-523 Arcade Building
SAN FRANCISCO—534 Fourth Street

WASHINGTON—201 Mills Building

Dealers Elsewhere. Write for Name of One Nearest You

Metal Office, Classroom and Cafeteria Equipment

(FOR METAL LABORATORY EQUIPMENT See Pages 486, 487)

RECORD FILING EQUIPMENT

Three, four and five-drawer Super-Filers for all types of records. The drawers of these cabinets have swing fronts that open as the drawer is opened and close as the drawer is closed, thus providing working space without any reduction of the filing capacity. Greater freedom of filing is secured, many of the ordinary operations of filing are mechanized. 18% more capacity, 25% faster filing. Three-drawer letter and cap files are of counter-height, four-drawer are standard height. The five-drawer cabinets give 48% greater capacity on the same floor space. Supplied with and without lock. No. 5404-L letter size unit as shown takes records up to 12¼″ x 11$\frac{5}{32}$″. No. 5404-C cap-size unit takes records up to 15½″ x 11$\frac{5}{32}$″.

COMBINATION CARD RECORD AND LETTER OR CAP-SIZE FILE

This file has two card index drawers at the top for 5 x 3 or 6 x 4 cards and three letter-size drawers for miscellaneous filing. Ideal for student records as the card record provides a means for cross reference. Also supplied with cap-size drawers.

CARD INDEX CABINETS FOR 5 x 3, 6 x 4 OR 8 x 5 CARDS

A wide variety of card index cabinets from single drawer units for use on top of a desk to twelve-drawer units as illustrated. Ten, eleven and twelve-drawer units for 5 x 3 cards; eight and nine-drawer units for 6 x 4 cards; seven and eight-drawer units for 8 x 5 cards, all in standard 52-inch height cabinets. Cabinets of counter-height also available.

LOWER-PRICED FILES FOR MISCELLANEOUS FILING

Four-drawer, rigid-front filing cabinets. These cabinets are of the conventional type, having rigid drawer fronts and compressors. Supplied in letter and cap-size, also in bill-size with five-drawers. Cabinets of similar grade also available in counter-height units.

SECTIONAL METAL BOOK CASES

Sectional Steel Book Cases. Strong, rigid inter-locking sections of various depths to accommodate books of varying heights. Sections are fitted with clear glass doors that operate on an equalizing mechanism that positively prevents wedging of doors when moved back into the cabinet. Non-warping construction. Bases and tops to match sections. Finished in oven-baked enamel—olive green or grained effects.

ADJUSTABLE BOOK SHELVING

Adjust-a-Shelf Book Units employ the same type of slotted shelf adjustment as standard library shelving of the larger installations. Units are supplied in 84-inch and 90-inch heights, each unit having a base shelf and six adjustable shelves. Adjustment slots are at one-inch intervals. Any number of units may be assembled together to form complete installations.

LIBRARY SHELVING

A special type of shelving for large libraries. Two types—free-standing and multiple-tier. Illustration shows part of an installation for the University of Minnesota. Engineering and consulting service for architects and building committees.

FIRE-RESISTIVE SAFES FOR VITAL RECORDS

Fire-resistive safes for student's records and college accounts. Highest rating of Underwriters' Laboratories for fire protection. Hundreds of cases of severe exposure and perfect performance of these safes attest their dependability. Interiors assembled from stock filing units to meet requirements.

WRITE FOR LARGE COMPLETE CATALOG OF METAL EQUIPMENT

METAL DESKS AND TABLES

Desks of 66″, 60″, 50″ and 45″ widths for office or instructor's use. Pleasing design, practical utility, durable construction and finish. Last for years minus repairs and refinishing.

Typewriter desks of 60″, 50″ and 45″ widths for business schools, commercial departments, school offices and boards of education. Full complement of drawers for records, supplies and filing.

Metal Tables for class rooms or offices, matching desks in construction and finish. 72″, 66,″, 60″, 50″, 45″ and 36″ widths.

SECRETARIES

Secretaries for teachers' records and dormitory rooms. Serves as telephone stand, writing desk, study table. Drawers for manuscript, examination papers, stationery and card records. Space for portable typewriter and pull-out shelf for writing or typing.

STEEL SHELVING FOR SUPPLY STORAGE

Steel Shelving for general supply rooms. Quickly erected or altered to meet any and all conditions of space or stored materials. Skeleton type, semi-enclosed or fully enclosed with doors. Provides systematic and controlled storage of expensive supplies.

STEEL SUPPLY STORAGE CABINETS

Steel Storage Cabinets for classroom or departmental supplies. Adjustable shelves, dust-excluding doors with locks. Combination units for supplies and wardrobe purposes.

Double-door Storage Cabinet with four adjustable shelves. Outside dimensions, 36″ wide, 78″ high and 19½″ or 25½″ deep.

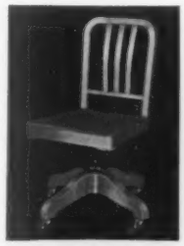
Single-door Storage Cabinet with four adjustable shelves. Outside dimensions, 24″ wide, 78″ high and 19½″ or 25½″ deep.

STEEL WARDROBES

Single and Double-door Wardrobes for teachers. Also may be assembled in batteries for pupils' wraps. Louvred backs for ventilation, hat shelf and coat rod in each cabinet. Doors fitted with automobile type lock handles. Outside dimensions of single door cabinet—24″ wide, 78″ high, and in 19½″ or 25½″ depths. Double door cabinets—36″ wide, 78″ high and 19½″ or 25½″ deep.

ALUMINUM CHAIRS FOR OFFICES, CLASSROOM, CAFETERIAS

Aluminum Swivel Chair for teacher's use. Light in weight and easily moved to and from desk. Genuine leather upholstery. Latest type swivel iron and ball-bearing casters.



Side chair companion to chair shown above. Strong, durable, light-weight aluminum construction.

Swivel chair for superintendent's office. An exceptionally comfortable and well proportioned chair. Made of aluminum. Upholstered in genuine leather. Light in weight. Ball-bearing casters and latest type swivel iron.

Tablet-arm Aluminum chair for classrooms. Strongly built, welded construction. Very portable and easily moved to facilitate sweeping operations.

Also special chairs and tables for cafeterias.

WRITE FOR LARGE COMPLETE CATALOG OF METAL EQUIPMENT

THE AMERICAN SCHOOL AND UNIVERSITY

THE GLOBE-WERNICKE CO.

Ross and Carthage Aves.
Cincinnati, Ohio

ENJOY THE ADVANTAGES OF EFFICIENT AND ATTRACTIVE OFFICE AND LIBRARY EQUIPMENT

Modern Globe-Wernicke equipment and systems for schools, libraries and offices enable people to accomplish more work with less effort, keep office routine operating smoothly, increase efficiency and economy. For more than fifty years the products of this company have been famous for their dependable quality and fine craftsmanship. Our resources and many years' experience are at your service.

STEEL FILING CABINETS

There is a G/W file for every business need and price range. Our better grades in steel and wood have the Tri-Guard principle. Each guide slides on three rods . . . they support as well as index contents of drawer . . . working space is provided without frequent readjustment of follower. Standard inserts solve individual problems, including document file, double box drawer and card index inserts.

HORIZONTAL SECTIONS

There are numerous kinds of Globe-Wernicke stock steel horizontal filing sections and units may be arranged to fit individual requirements. These horizontal sections are light in weight, strong, and easy to intermember or rearrange. There are two standard depths and widths: 17″ and 25″ deep and 33″ and 16½″ wide.

STORAGE CABINETS

Globe-Wernicke steel storage and wardrobe cabinets are made in two grades and in a variety of styles and sizes to fit the floor space available and for many storage needs. Contents are kept clean and quickly accessible, losses prevented and privacy assured. They are fire resistant and practically dust-proof.

STEEL DESKS AND TABLES

Many exclusive features of construction and design make G/W steel desks and tables very desirable for office and school use. These fine steel desks represent highest standards of quality and combine efficiency, distinctive appearance, durability and long, useful service. They are made in styles and sizes for every office requirement.

STEEL SHELVING

G/W steel shelving provides economical storage service for a business lifetime. It is easy to install and can be adapted to the floor space available. Additional units may be obtained for expansion and shelving can be taken down and reset with 100% salvage. Steel shelving will not burn, does not deteriorate and is widely used in schools and public institutions.

BOOKCASES

Globe - Wernicke sectional bookcases are available in several distinctive designs and standard finishes for school, home and office. They combine attractive appearance, convenience, efficiency and economy. Unit includes top, base and book sections of four different heights and more sections are easily added when needed . . . made of wood or steel.

ANGULAR CELLULOID TAB GUIDES

These index tabs look you straight in the eye — they are easy to read, easy to find. Tabs are set at an angle of 45°. There is no stooping or bending and pushing contents about in order to read labels.

G/W angular celluloid tab guides and folders save work, prevent filing fatigue, reduce wear and tear, speed up filing and finding. Inserts are removable, making possible unlimited expansion.

STEEL SLOTTED TYPE BOOK SHELVING

Slotted type book shelf units offer an economical, space-saving method for housing books. Removable end panels permit expansion. Extra units may be added as desired. Units are regularly furnished with six shelves, adjustable every half inch.

OFFICE ACCESSORIES

There are many dependable G/W business accessories which increase efficiency and make work easier . . . needed in every office.

"ACCESSO" WOOD DESK TRAYS

Wide hand openings on all four sides and bottom make it very easy to handle papers.

STEEL CARD INDEX CABINETS

Provide an economical method for keeping records . . . for 3 x 5″, 4 x 6″ and 5 x 8″ cards.

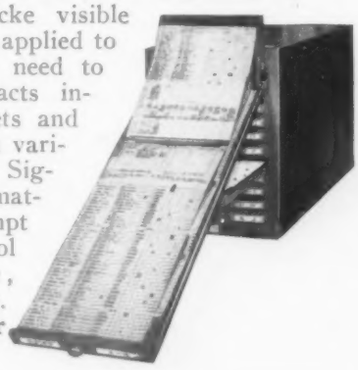
WASTE BASKETS

Attractive . . . rounded corners . . . with or without legs . . . two sizes.

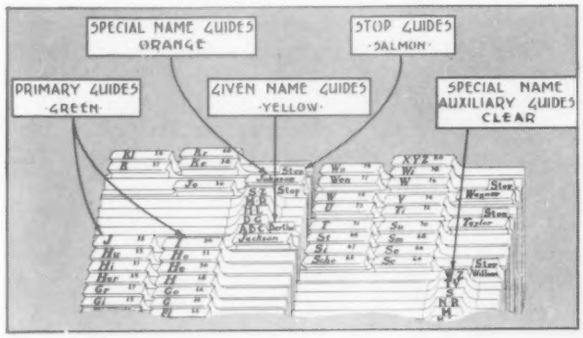
EVERDAY FILES

Handy, inexpensive . . . made in 11 styles of indexing.

VISIBLE RECORD EQUIPMENT



The Globe-Wernicke visible record system can be applied to every record-keeping need to provide important facts instantly. Both cabinets and books are available in various styles and sizes. Signals call attention to matters that require prompt attention. This control system saves time, work and money. Forms are provided for any type of record.



CARD INDEX SUPPLIES

When selecting cards and guides, consider the purpose for which they will be used to get best results. Globe-Wernicke offers a wide range of card index supplies in various grades, including stock and special printed forms for almost every record need. Above is illustrated the safeguard filing plan—the simplest and best method of filing . . . for card or letter files.

WOOD LIBRARY EQUIPMENT

If you are planning additions to your school or library equipment, let us help solve your problems.

Globe-Wernicke products include filing cabinets and supplies, steel desks and tables, storage cabinets, bookcases, steel shelving, visible record equipment, office accessories, partitions, stock and special equipment for schools, libraries and public institutions. Write to us for more information.

LYON METAL PRODUCTS INCORPORATED

1336 Madison Ave., Aurora, Illinois

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES: Aurora and Chicago Heights, Illinois

CONSULT YOUR CLASSIFIED TELEPHONE DIRECTORY
PLANTS: Jersey City, N. J.; Los Angeles, Calif.

LOCKERS--LOCKER WARDROBES--FOLDING CHAIRS--STORAGE CABINETS STEEL SHELVING--LOCKER WORK BENCHES--SHOP EQUIPMENT

STEEL FOLDING CHAIRS

There are eight styles of Lyon Posture-Perfect Chairs to meet your portable seating requirements. The extra wide seat, curved and pitched to fit the body, plus the form fitting back rest gives hour-after-hour solid comfort. The complete line also includes Tablet Arm Attachments; Ganging and Tresholding equipment; Rolling Storage Trucks and Steel Folding Tables. Write for Catalog No. 835.

LOCKERS

For almost 40 years Lyon Lockers have met the requirements of school executives. Millions more of Lyon Lockers are in use today than any other make. There is a Lyon Locker for every storage requirement. Single tier, double tier, two-person, gym type, double door, and box lockers, also basket racks. Request the Lyon Handbook No. 233.

LI-FLAT CABINETS

Large or small drawings, maps, etc., are stored flat, neatly, and orderly. Each section consists of a five-drawer unit. Additional sections may be added and no finishing moldings are required. Open or closed base is optional. Bottom and side of each drawer is punched on 3⅛" centers for dividers, thus providing a place for uniform size drawings. Write for Catalog No. 471.

WORK BENCHES

Vocational departments require the equipment used by modern industry. There are several styles, types, and weights; available in many sizes. Steel legs for use with wood tops also available. Catalog No. 323.

LOCKER WORK BENCHES

A student's work bench with storage space under the top, out of the way, yet readily accessible. The student may start to work immediately when entering the classroom; no ganging or crowding at storage rooms. Lyon Locker frame construction provides a sturdy base for bench top, which is furnished by others. Bulletin No. 244 gives complete details.

STEEL STORAGE SHELVING

There is a type for any storage requirement. Flexibility, maximum adjustment, and complete inter-change of parts makes possible efficient storage facilities. Catalog No. 120. Ask for a Lyon Storage Engineer to assist with your storage problems.

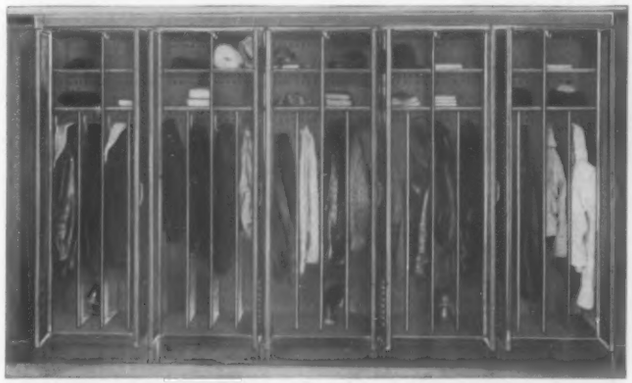
STORAGE CABINETS

There are several styles for individual storage requirements. Storage, Wardrobe, Combination Wardrobe, Counter-hi, and Desk-hi. Several styles with single or double doors.

TOOL STORAGE UNITS

Valuable tools systematically stored and cared for means many dollars saved. Whatever your requirements may be, there is Lyon equipment to meet your needs. Complete adjustment makes possible adequate storage space for changing storage needs.

THE LYON LOCKER WARDROBE FOR ELEMENTARY SCHOOLS



Battery of Locker Wardrobes with Type "A" Interior Arrangement—A Separate Compartment for Every Pupil

Lyon Locker Wardrobes Installed in Classroom Providing Neat, Orderly and Compact Clothes Storage

SPACE SAVING ADVANTAGES AND CONSTRUCTION FEATURES

The paramount interest of Architects and School Executives when planning a new building is "the best and most school" per dollar spent for construction and equipment. The Lyon Locker Wardrobe used in place of conventional clothes storage equipment offers an opportunity to reduce the cubic content required for these facilities as much as 45%.

Locker Wardrobes may be installed in unfinished recesses and no special framing is required. The cost of finished floors, walls and ceilings is eliminated. There is nothing else to buy as Lyon Locker Wardrobes are complete when installed.

Each unit is self-contained, being built of steel—is vermin proof and fire resisting. Doors operate independently of any floor connections. They cannot sag, warp, bind or get out of shape. Rubber silencers in door jambs, together with unusually quiet latching device, eliminates objectionable operating noises. Continuous trouble-free service is assured.

FEATURES OF CONSTRUCTION

1. One master locking device controls all doors in a battery of up to 10 units that will accommodate 40 pupils.
2. Teacher unlocks and releases all doors in the battery. Pupils may open and close doors independently.
3. Master locking device may be set in lock position and doors closed independently. They then automatically lock.
4. Teacher's Wardrobe and Book Case may be installed at either end of a complete battery, but are operated independently of Locker Wardrobe locking device.

The master locking device eliminates lost keys and forgotten combinations, reduces clothing losses, and mix-up of children's belongings. It gives the teacher full supervision over pupils' clothing with a minimum of time and effort.

Several interior arrangements are available as illustrated and described below.

INTERIOR ARRANGEMENTS

Type "A." Four hat and book compartments, 11 in. wide, 7½ in. high, four coat compartments; outside two 6 in. wide, inside two 5 in. wide, 44 in. high; each fitted with one single prong hook.

Type "B." Four hat and book compartments, 11 in. wide, 7½ in. high; one coat compartment 22 in. wide, 44 in. high, fitted with three double prong hooks and two single prong hooks.

Type "C." Four hat and book compartments, 11 in. wide, 7½ in. high; two coat compartments 11 in. wide, 44 in. high, each equipped with one double prong hook and two single prong hooks.

Type "D." Two shelf compartments 22 in. wide, 7½ in. high; one coat compartment 22 in. wide, 44 in. high, fitted with three double prong hooks and two single prong hooks.

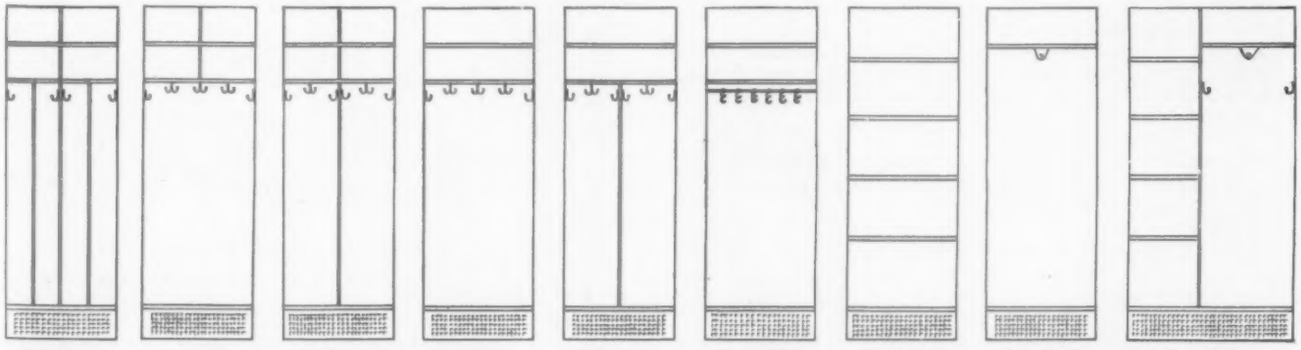
Type "E." Two shelf compartments 22 in. wide, 7½ in. high; two coat compartments, 11 in. wide, 44 in. high, each equipped with one double prong hook and two single prong hooks.

Type "F." Two shelf compartments 22 in. wide, 7½ in. high; one coat compartment 22 in. wide, 44 in. high equipped with coat rod and six sliding hooks. This arrangement adaptable for storing six pupils' clothing in one unit.

Teacher's Wardrobe. One shelf space 22 in. wide, 7½ in. high and one coat space 22 in. wide, 44 in. high, with coat hanger rod, two single prong coat hooks and individual flat key lock.

Book and Supply Case. Four shelves adjustable on 2 in. centers. For books, classroom supplies, etc. Fitted with individual flat key lock.

Teacher's Combination. One section for clothing, one section for books and supplies. Width overall 33 in., height 60 in. Clothes compartment 18¾ in. wide, shelf space 7½ in. high, and coat hanger rod. Equipped with two single prong coat hooks; individual flat key lock. Supply section 14¼ in. wide with four shelves adjustable on 2 in. centers.



Type "A" Type "B" Type "C" Type "D" Type "E" Type "F" Book and Supply Case Teacher's Wardrobe Teacher's Combination

METAL OFFICE FURNITURE COMPANY

Grand Rapids, Michigan

FACTORIES IN Grand Rapids Michigan

BRANCHES IN
New York City 437 Eleventh Ave.
Boston 115 Purchase St.
Los Angeles 923 E. Third St.
Seattle 609 Third Ave.

DEALERS IN ALL PRINCIPAL CITIES

STEELCASE *Business Equipment*

TERRELL STEEL LOCKERS

4 ADDED ADVANTAGES AT NO EXTRA COST

Adaptability

A complete range of sizes and styles meets every need of school or gymnasium. Any grouping of full-height, double-tier or box lockers can be supplied.

Safety Handle

All fastening points are concealed in handle. Pilfer-proof, since handle cannot be pried off. Padlock eye is also concealed in handle.

Latching Bar

No meddling possible because it is enclosed and protected between return flange on door and a formed channel. This channel adds strength to the door.

Pre-Locking Device

Positive in operation, pick-proof, simple in design. Two working parts. When door is opened, padlock may be replaced and locked, or key turned, then when door is closed it is automatically locked.

Silenced Operation

Soft molded rubber bumpers are securely riveted and tenoned into door jambs. Similar bumpers silence latching bars. This eliminates noise.

Sturdiness

Rigid construction, acetylene welded frame corners, angle-type legs which are a part of the locker frame—these and other features add to the strength of Terrell Lockers.

Appearance

Attractive finishes, no weld marks, rust-proof bolts (none on fronts), concealed hinge-pins—these enhance the appearance of Terrell Lockers.

STEEL BOOK STACK UNITS

Here is modern steel book shelving in its best and simplest form—designed and built for the utmost in service for educational institutions.

Easily planned — easily installed—very reasonably priced.

Book Stack Units can serve you as efficiently as they are serving many other leading universities and schools.

SIMPLIFIED, MODERN STEEL BOOK SHELVING

Simplicity

Sold as units, no complicated parts to figure. Intermembering units (of varying widths if required), with duplicating parts omitted, match perfectly in building an assembly.

Sizes

Offered in an assortment of sizes—widths 30″, 36″, 42″—depths 9″, 12″—heights 6′ 6″, 7′ 6″, 8′ 6″.

Capacity

These Book Stacks will accommodate 10% more books than sectional glass door bookcases of the same height. Rounded front posts give maximum shelf width.

Flexibility

A combination of sizes for any space. Shelves adjustable every inch for books of any height. Easily and quickly rearranged.

Strength

The construction of upright posts, tops, bases and shelves insures strength and rigidity in every part. No sagging of shelves even under the heaviest load.

Protection

No rough bolts or raw edges of steel can come in contact with books or hands. Front edge of shelf is triple-flanged for added protection.

Beauty

Designed, built and finished to harmonize with the finest furnishings. The attractive cornice top adds a touch of conservative artistry to each unit.

METAL OFFICE FURNITURE COMPANY

Grand Rapids, Michigan

FACTORIES IN Grand Rapids Michigan

BRANCHES IN
New York City 437 Eleventh Ave.
Boston 115 Purchase St.
Los Angeles 923 E. Third St.
Seattle 609 Third Ave.

DEALERS IN ALL PRINCIPAL CITIES

STEELCASE *Business Equipment*

DESKS AND TABLES

Four grades of desks and tables are available for every office requirement. Made in a complete range of types and sizes. The moderne, No. 5021, Flat Top Desk, as illustrated, is attractive, efficient, economical and will give a lifetime of service.

SECTIONAL EQUIPMENT

Adaptable to large offices or to small departments or offices where requirements are limited to no more than a single letter file and a card index file. Extreme flexibility of wide and narrow sections permits additions to serve every need.

BOOKCASES

These glass door bookcase sections are substantially constructed units, carefully designed and built. Doors are of disappearing type, dust-proof with equalizing device. Three heights, with top and base, intermember perfectly, permitting easy expansion.

Built-to-Order Equipment

Display and Museum Cases

Write for Details

THE AMERICAN SCHOOL AND UNIVERSITY

FILING CABINETS

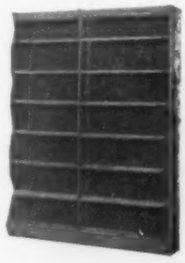
Steelcase files are made in several grades of construction, in suspension and non-suspension types, in various heights from 5-drawer down to single drawer units, in a drawer arrangement for every purpose, in attractive and substantial finishes.

STORAGE CABINETS

Twenty-one sizes and styles of cupboards and wardrobes provide a stock unit for every storage requirement. They are attractively finished, strong and sturdy in construction and very convenient and adaptable in use.

SHELVING

Three types of steel shelving provide the proper kind for use wherever shelf storage is required, whether in libraries where an attractive appearance is necessary or in store-rooms where heavy loads require reinforced shelves.



SAFES

Steelcase safes are furnished in two grades — a Class "B" and "T-20" Grade for extreme risks where safety and protection of records is most important and a Commercial Grade for less exacting conditions. A full range of sizes.

SECURITY STEEL EQUIPMENT CORPORATION

Avenel, New Jersey

DEALERS IN ALL PRINCIPAL CITIES

Security STEEL

"SUPERIORITY IS INHERENT IN ALL PRODUCTS"

STANDARD AND PLANNED OFFICE EQUIPMENT

FILING EQUIPMENT

No. 7701

7700 Line Files

These files include every improved feature and constructional refinement developed in recent years.

Built with the famous Security Progressive Cradle-Type Suspension, these files will withstand the demands of the heaviest filing requirements.

No. 1701

LOW-PRICED FILES

1700 Line

Where utility plus economy is the prime factor, our "1700 Line" is the answer.

Constructed to high Security requirements, the drawers will not sag, even when fully extended.

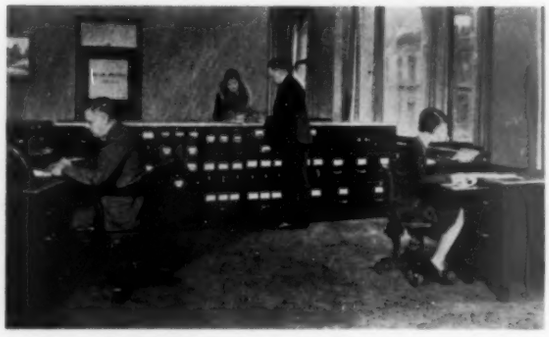
Security Files are available in 5 Grades and 5 Heights. Standard finishes are olive green, walnut and mahogany.

LIBRARY EQUIPMENT

SECURITY STEEL Library Shelving has no sharp corners or edges that might harm a binding or injure the hands or clothing of anyone. The sides of the shelves are perfectly flush with the sides of the uprights. In addition, the shelving is **Fire-Resistant** and **Insect - Proof.** Simplicity of construction coupled with beauty of design fit this shelving to be used in the most elaborate libraries. A consultant staff of steel equipment experts is ready to co-operate with architects or building committees.

In addition to the library shelving, the regular steel storage shelving for general supply rooms is available, shelving that can be fitted into practically any space and set up without difficulty.

COUNTER HIGH FILING CABINETS



SECURITY STEEL Counter High Filing Cabinets effectively partition office space for reception of visitors and transaction of business. This equipment effects real economy. It conserves floor space and reduces work by keeping records immediately available. The cabinets can be equipped with individual or continuous tops covered with battleship linoleum bound with bronze binding. Files are equipped with bronze handles and label holders. The arrangement of this type of cabinet is almost unlimited.

STEEL SECTIONAL BOOKCASES

SECURITY STEEL Sectional Bookcases with receding glass doors protect treasured volumes in office or library. Doors will positively not wedge when moved back into cabinet. Bases and tops to match sections. Additional sections may be added any time.

LITERATURE AVAILABLE ON ALL LINES

DESKS AND TABLES

2 LINES—3 DIFFERENT LEG ARRANGEMENTS

PERIOD PRESIDENTIAL LINE

4 Legs

6 Legs

8 Legs

To an already comprehensive line, Security has added another amazing feature—4—6 and 8 leg arrangements. This means that all Security desks are tailor-made insofar as leg arrangement is concerned.

A new constructional feature—"Bridge Construction"—with all the rigidity and strength the term implies, adds to the long list of exclusive Security achievements.

All **Security Steel** desks are built to the rigid specifications of the Federal Specification Board of the Government.

THE NEW STANDARD LINE

The ideal desk for teachers, clerks, etc. The highest grade of commercial desk—available in many styles.

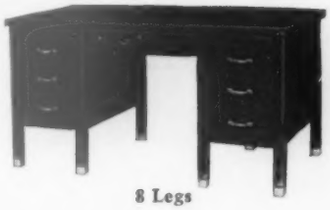
THE PERIOD PRESIDENTIAL LINE

Combining the charm of fine period furniture with the efficiency, economy and endurance of steel—a desk that will lend prestige to any university or school office.

STANDARD LINE

4 Legs

6 Legs



8 Legs

STORAGE CABINETS

For a thousand and one uses. Made in various sizes and styles, including counter and desk heights, to fit individual needs. Provides economical storage for advertising literature, office supplies, stationery, etc., and affords the most satisfactory means of keeping such materials away from dust and dirt.

PLANNED EQUIPMENT

Special SECURITY STEEL installations engineered by Security experts to fit individual needs. Federal, State and Municipal Governments, banks, public utilities, schools, universities and nationally and internationally known business concerns are profiting by Security Planned Equipment Service.

A complete survey of your particular equipment problem or assistance to architects and building committees will be made by our experts with no obligation.

WARDROBE CABINETS

A popular item for teachers. The center partition divides the cabinet into two compartments—one for storage and the other for wardrobe purposes. Complete privacy is assured.

MISCELLANEOUS ACCESSORIES

Many additional items of enduring SECURITY STEEL are available, even though not shown on these two pages. Write for information pertaining to products in which you are interested.

LITERATURE AVAILABLE ON ALL LINES

FRED MEDART MANUFACTURING CO.

3568 Dekalb St. St. Louis, Mo.

Manufacturers of

Steel Lockers—Steel Wardrobes (The Lockerobe)—Steel Shelving—Gymnasium Apparatus—Basketball Backstops—Telescopic Gym Seats—Playground Apparatus—Water Sports Equipment

STEEL LOCKERS

"Standard of Comparison," the title by which Medart Lockers are widely acknowledged both in the industry and among knowing buyers, is fittingly applied. . . . "Medart" has long served in the role of pioneer in the Locker manufacturing field and as a result, most of the details common in all lockers today first appeared as part of a Medart Locker. . . . All lockers are not alike. . . . In the current model, "Medart" includes a number of exclusive and desirable features that merit the careful consideration of the buyer. Compare!

Write for Locker Catalog L-6

STEEL WARDROBES

The Lockerobe

Space wasting cloakrooms and less efficient wardrobes are rapidly giving way to the modern thought in elementary school wardrobe equipment — The Medart Steel Lockerobe. Lockerobes require a recess depth of only 16 inches! One of the most important of the several functional advantages of Lockerobes, which is of special interest to school officials, is the system of simultaneous door control as provided by "Medart." Supervision of the wardrobe doors is reduced to a minimum. The teacher or a monitor quietly opens and closes all wardrobe doors by the simple operation of one pair of doors. Complete details upon application.

Write for Lockerobe Catalog LRM-4

STEEL SHELVING

Books, classroom supplies, etc., are stocked better, inventoried quicker, and distributed faster when the storeroom is equipped with Medart Steel Shelving. . . . Easy to install, safe to use, and readily dismantled (all parts are interchangeable) for future rearrangements. . . . Medart Steel Shelving fully conforms to the exacting specifications of the Federal Government. . . . Complete engineering service available to interested parties without obligation. . . . "Let Medart lay out your stockroom equipment requirements."

Write for Shelving Catalog S-7

WORLEY & CO.

General Offices and Factory: Pico, California

Los Angeles Seattle Salt Lake City San Francisco Portland Honolulu

STEEL SCHOOL EQUIPMENT

LOCKERS (ALL TYPES)
WARDROBES
CABINETS (STORAGE)
BASKET RACKS AND TRUCKS
SHELVING (ALL TYPES)
ROTC GUN RACKS
DRAWING TABLES
LOCKER ROOM BENCHES
SHOP BENCHES

For more than 15 years, Worley & Co. have enjoyed the privilege of aiding most of the schools, colleges and universities in the West in the solution of problems pertaining to the safe, economical storage of individual and group clothing, materials and supplies. New designs and improved methods of construction, developed by this organization to meet these needs, have proved to be so sound in principle that they have formed the foundation now almost universally recognized as the Standard of Quality in all Steel Equipment for schools.

Worley Engineering Service begins with an analysis of the institution's needs, followed by specific recommendations with an eye not only for the immediate problem but for future requirements. For this reason, as additional equipment is needed, it is possible to maintain the same standards with complete uniformity, both as to the equipment itself and the Service which follows through, long after the installation is completed.

WORLEY LOCKERS

Worley Steel Lockers provide an excellent example of the manner in which Worley & Co. have led in the development of design and construction for long life and dependable performance. The Frame, Hinges, Doors and Latching Devices . . . the secret of greater value in any locker . . . were developed to provide for strength, flexibility, easy and silent operation and minimum maintenance.

Every type of Locker is supplied, either in individual units or in groups or combinations to fit every need as to utility or available space. Highest quality materials are used in the construction and finish to make Worley Lockers a dependable standard of value. Recommendations will be submitted gladly to meet specific needs. Write for Illustrated Bulletin.

Single Tier Locker

Double Tier Locker

SINGLE TIER LOCKERS

Furnished in Wall Type (Single Row) or Back to Back (Double Row). The most popular of all types; ideal for corridors, teachers' rooms or offices, wherever overcoats or other long garments are carried.

DOUBLE TIER LOCKERS

Furnished in Wall Type (Single Row) or Back to Back (Double Row). Used both for Corridors and Gymnasiums where floor space is limited and where contents do not require a full-length Locker.

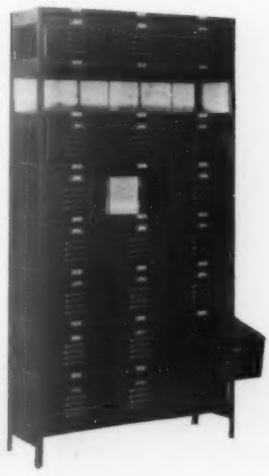
GYMNASIUM LOCKERS

Furnished in Wall Type (Single Row) or Back to Back (Double Row). Gymnasium Lockers eliminate the use of baskets and provide adequate ventilation (backs, sides, tops and bottoms may have full louvre or round hole perforation). They use no more floor space, require less supervision and cost less. Gym suit lockers and dressing lockers are combined into groups in any ratio desired, depending on the number of gym classes per day. The illustration at left shows a 12-student group arranged for 6 gym classes per day. Padlocks are recommended.

BASKET RACKS AND TRUCKS

Worley Basket Racks and Trucks, equipped with Worley new type **all-steel** baskets, assure far greater strength, durability and safety than the ordinary type. Baskets have heavy expanded metal sides, louvred fronts and backs and perforated bottoms, giving complete ventilation. Steel fronts make it impossible to see contents of baskets.

Worley All-Steel Basket



DICTAPHONE CORPORATION

EDUCATIONAL DIVISION

420 Lexington Ave., N. Y. C.

Students, Prepared for a Successful Future by the Dictaphone Business Practice Course, ...

Find that the Famous Dictaphone Certificate of Proficiency is an "Open Sesame" to . . . . .

SUPPLY AND DEMAND

IN THESE highly competitive times, the modern executive has developed the habit of demanding the highest type of secretary available . . . the girl who is Dictaphone-trained!

The supply of Dictaphone-trained secretaries has never been sufficient to meet this ever-growing demand.

Thus, logically, schools adopting the Dictaphone Business Practice Course provide their graduates with an indispensable business skill that insures their successful candidacy for choice secretarial positions.

Text book, by Monk, published by Lyons and Carnahan, and 18 full length Permanent Practice Records are available for student practice.

Write for complete details. There is no obligation.

DICTAPHONE CORPORATION

EDUCATIONAL DIVISION

420 Lexington Ave., N. Y. C.

Better, Higher-Salaried Secretarial Positions with Progressive Businessmen, where . . . . . .

There is a Definite Opportunity for them to become Executives Themselves.

OTHER COURSES SPONSORED BY DICTAPHONE

DICTAPHONE EQUIPMENT FOR SPEECH INSTRUCTION

Standard Dictaphone equipment has gained tremendous popularity among speech teachers. The Dictaphone System provides 100 record surfaces of 10 minutes each for the low maximum cost of 75c.

The economy and availability of Dictaphone equipment enable students to make daily practice recordings—an indispensable adjunct to effective speech instruction.

Pattern Records and text book—Acceptable American Speech, by Raubicheck and Seals—available for auditory training.

DIRECT DICTATION TYPEWRITING COURSE

A 4-semester course that actually takes only 3 semesters to complete! Text book and 40 Permanent Practice Records.

Write for Free Tests and Teaching Aids Available with These Three Courses

THE AMERICAN SCHOOL AND UNIVERSITY

THE EDIPHONE--THOMAS A. EDISON, INC.

Laboratory and General Offices: West Orange, N. J.

New enclosed desk model spurs Ediphone installations

The new enclosed Ediphone is appearing on the desks of business men from New York to San Francisco—from Dallas to Toronto. Big companies... little companies... municipal offices... all types of business are switching to this modern way of handling correspondence, memos, requests, appointments and the host of daily business details. This offers you educational opportunities because...

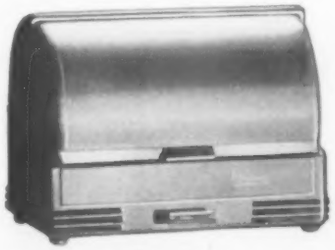
More employers ask for "Ediphone Secretaries"

With every new Ediphone installation comes the need for "Ediphone Secretaries". Every change-over makes another employer "Ediphone conscious". He immediately thinks of stenographers and secretaries in terms of their ability to use the Ediphone. Says the president of one of New York's largest personnel agencies, "The demand for personnel familiar with the Ediphone is constantly expanding due to the many new Ediphone users".

Help your Students get these Jobs with...

The Ediphone Secretarial Course

The growing demand for "Ediphone Secretaries" gives you a welcome opportunity to be of greater service to your secretarial school students. Add the Ediphone Secretarial Course to your curriculum—it's easy to fit in. You will be making a huge stride forward in smoothing the path to employment for your students. Get the facts on the practical Ediphone Secretarial Course. Write to the Department of Educational Training, Thomas A. Edison, Inc., West Orange, N. J.



The new enclosed Desk Model. Most sensational dictating machine ever developed. Completely enclosed—dust-proof.

The Standard Floor Model Ediphone—thousands of these machines are in use.

This diploma will help your graduates get jobs. It's the Certificate of Proficiency in the use of the Ediphone.

TEACH VOICE WRITING WITH THE

Ediphone
EDISON VOICEWRITER

UNDERWOOD ELLIOTT FISHER COMPANY

Typewriters...Accounting Machines...Adding Machines...Carbon Paper...Ribbons...and other Supplies

Complete Sales and Service in all principal cities

ONE PARK AVENUE NEW YORK, N. Y.

UNDERWOOD TYPEWRITERS

NEW UNDERWOOD MASTER TYPEWRITER . . . Modern, fast and dependable. Completely enclosed back, fully visible writing, quiet action, non-glare finish. Champion Keyboard . . . keyset tabulator and Dual Touch Tuning.

UNDERWOOD NOISELESS STANDARD TYPEWRITER . . . Pressure stroke action for noiseless operation with Champion Keyboard . . . non-glare finish. Available in various carriage widths.

UNDERWOOD TYPEWRITERS are available in 11", 12", 14", 18", 20" and 26" carriage widths—a request will bring you full information. **THE UNDERWOOD STANDARD TYPEWRITER with AUTOMATIC JUSTIFYING DEVICE**, which produces even right hand margins, is on display at all Underwood Elliott Fisher Branch Offices.

UNDERWOOD PORTABLE TYPEWRITERS

CHAMPION TYPEMASTER MODEL with inbuilt tabulator, completely enclosed back, touch tuning. Complete with carrying case.

•

STUDENT MODEL has standard keyboard, back spacer . . . ideal for students of all ages. Complete with carrying case.

NEW NOISELESS MODEL with all Underwood Portable features. Quiet, efficient and reliable. Complete with carrying case.

UNIVERSAL TYPEMASTER MODEL is the popular general purpose portable. Typemaster features. Complete with carrying case.

•

NOISELESS 77 MODEL . . . a de luxe portable with inbuilt tabulator and Pressure Stroke Action. With or without carrying case.

UNDERWOOD ELLIOTT FISHER COMPANY

Typewriters...Accounting Machines...Adding Machines...Carbon Paper...Ribbons...and other Supplies

Complete Sales and Service in all principal cities

ONE PARK AVENUE NEW YORK, N. Y.

UNDERWOOD SUNDSTRAND ADDING-FIGURING MACHINES

UNDERWOOD SUNDSTRAND FRONT FEED PORTABLE POSTING MACHINE... an all purpose Figuring Machine for addition, subtraction, multiplication, division and the preparation of Statements and Ledgers. Features include automatic cross tabulation, automatic month, automatic non-addition, automatic subtraction, automatic credit balances, automatic non-print. Also many optional features available.

UNDERWOOD SUNDSTRAND PORTABLE ELECTRIC MODEL with only 10 numeral keys ... arranged naturally for touch operation. Three point control of addition, subtraction, multiplication, division, non-addition, totaling and subtotaling. Various column capacities. ALSO complete line of electric and hand operated **UNDERWOOD SUNDSTRAND** adding-figuring machines with features for each figure problem.

UNDERWOOD ELLIOTT FISHER ACCOUNTING MACHINES ... an individual model for every accounting need ... are available at all UEF Branch Offices. For complete information address your inquiry to the Accounting Machine Division, Underwood Elliott Fisher Company, One Park Avenue, New York, N.Y.

UEF SUPERIOR SUPPLIES

1. Type Cleaner
2. Adding Machine Paper Rolls
3. Carbon Tally Rolls
4. Machine Oil
5. Ribbons
6. Brushes
7. Typewriter Pads
8. Carbon Paper
9. Carbon Paper Rolls
10. Cushion Keys

L C SMITH & CORONA TYPEWRITERS INC

General Offices: Syracuse, N. Y.

FACTORIES: Syracuse, N. Y. Groton, N. Y. Cortland, N. Y. Geneva, N. Y. Aurora, Ill.

BRANCH OFFICES IN 42 PRINCIPAL CITIES. DEALERS EVERYWHERE

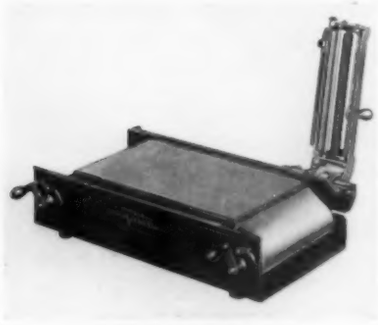
Makers of L C Smith Standard Typewriters—L C Smith Silent Typewriters—Corona Portable Typewriters — Vivid Duplicators — Corona Adding Machines—Type Bar Brand Ribbons, Carbons, and Supplies.

For 30 years, L C Smith has been an outstanding name in the **office typewriter** field—for sound design, honest construction, and long-lived efficiency. For almost a like period, Corona has been the foremost name in **portable** typewriters. Their combined experience and good name stand behind every L C Smith & Corona product.

The Super-Speed Standard L C Smith Office Typewriter

The famous ball bearing typewriter noted for its ease and speed of operation—long the favorite of court reporters and other typists who require the utmost in dependability. Floating shift, right or left hand carriage return, micro touch selector, etc. A wide variety of carriage widths, type faces and special keyboards to order.

Vivid Duplicator



Vivid Junior

Reproduces everything that can be drawn with pen or pencil or typed—in up to eight colors — for a cost of only a few cents per 100 copies. Invaluable for seat work tests, assignments and many types of projects; saves endless dictating and copying time. Vivid Rolls, for all types of gelatin duplicators, give exceptionally bright and uniform results.

Corona Adding Machine

Low price, convenient portable size. All standard features including All-Visible keyboard; automatic ciphers; automatic signals; all feature keys; large, legible printing properly punctuated; large capacity. For school or office.

Corona Adding Machine

The Super-Speed Silent L C Smith Office Typewriter

This is the pioneer Silent machine of STANDARD design—hence may be operated at the same high speed and efficiency of the standard typewriter. Machine noises virtually eliminated; impact noise substantially reduced. Popular for secretarial work—reduces nerve strain and operating fatigue to a minimum. Smith floating shift, ball bearing type bars, interchangeable platens, micro touch selector and many other new features.

Corona Portable Typewriters

Corona is the pioneer portable typewriter. Several models at prices to suit every purse. Four rows of keys, standard keyboard arrangement, floating shift, piano key action, touch selector, etc. Complete with carrying case and typing instruction chart. Easy payments if desired.

Type-Bar Brand Ribbons, Carbons, and Supplies

Excellent quality de luxe and standard grades, for every typewriter requirement. Ribbons are evenly inked, lightly or heavily as desired. Carbon papers are carefully graded for uniformity.

Burroughs

can answer the EXACT NEEDS of every SCHOOL BOARD AND COLLEGE BUSINESS OFFICE

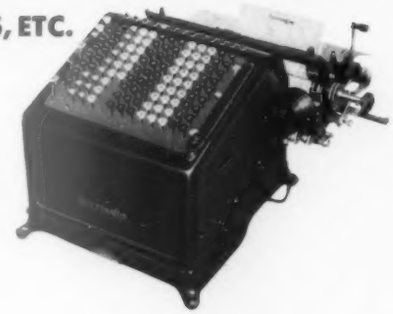
Preparing budget, expenditure, payroll, and many other records is greatly speeded and simplified on Burroughs machines. In the smaller and medium size school, the versatility of Burroughs machines permits several different types of work to be done on *one* machine. For the large school, the complete Burroughs range permits selection of the *exact* machine for the *exact* job, with all related records written *in one operation*. Learn what savings can be made in your office by calling the nearby Burroughs representative.

BUDGET AND EXPENDITURE RECORDS

Complete budget, expenditure, and income and fund account records, including current balances, are provided on this, and other, budgetary accounting machines. Neat, accurate records available for ready comparison with previous periods.

PAYROLL, STORES, ETC.

Provides a combination of records in one operation. Inventory ledger, showing quantity and value, prepared as requisitions are computed and proved. Time tickets computed, complete payroll records handled in one operation.



ORDER WRITING

Electric carriage return and electric capital shift relieve the typist of much fatiguing work. Ideal for reports, correspondence, etc., this low-cost machine can also be equipped to write several payroll records simultaneously, check and check register, etc.

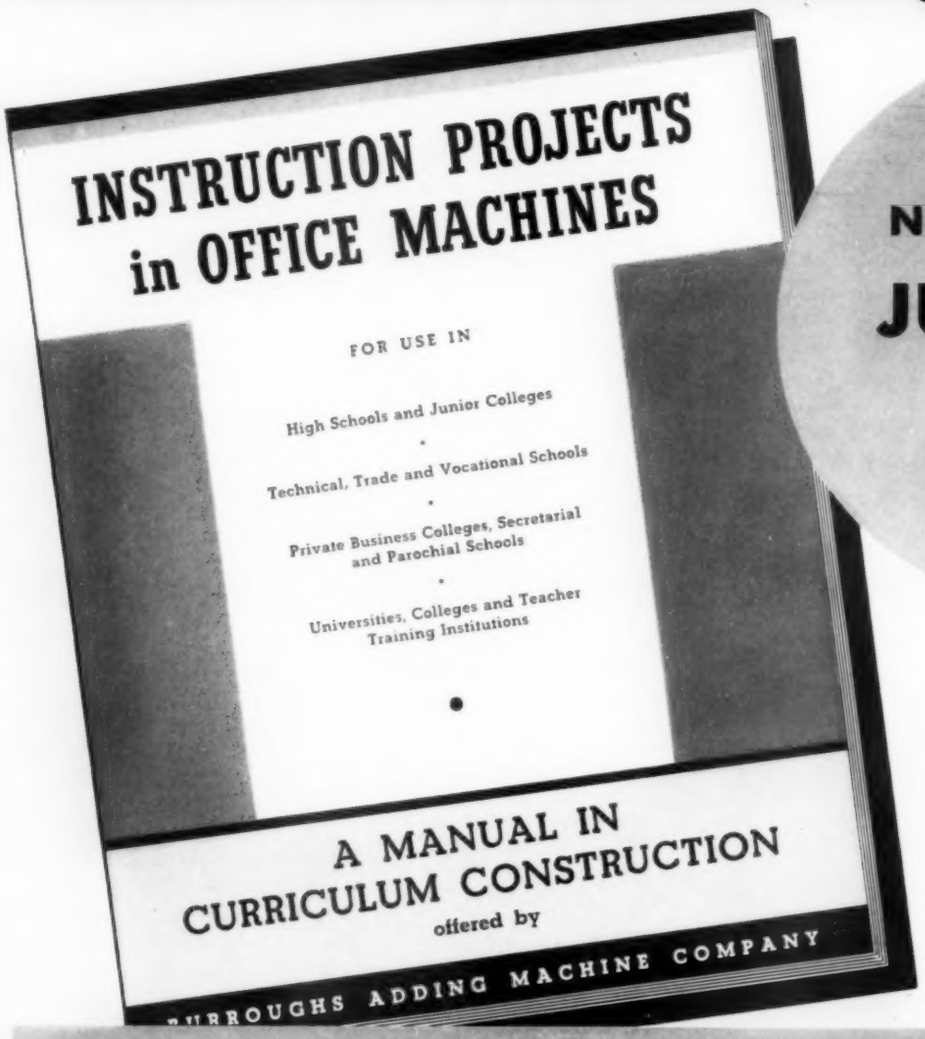
CAFETERIAS, BOOKSTORES, ETC.

Cash registers, itemizing cash registering machines, and cash receipting machines come in a variety of styles for cafeterias, book stores, etc. Cafeteria models provide printed customer's receipt and furnish locked-in record for balancing and audit purposes.

OTHER JOBS—*In addition to the types described above, Burroughs offers a variety of machines for plant accounting, receipt and disbursement distribution, pension fund accounting, and for hospital, laundry, dining room, and residence accounting.*

BURROUGHS ADDING MACHINE COMPANY . . . . DETROIT, MICHIGAN

Burroughs



A NEW BOOKLET JUST OFF THE PRESS

Instruction Projects in Office Machines **is a comprehensive, 28-page manual covering the subject of curriculum construction. Contains suggested plans for organizing various machine courses and describes and illustrates reference material available for instruction purposes.**

BURROUGHS MACHINES SELECTED BY SCHOOLS

Burroughs Desk Model Bookkeeping machines offer the classroom advantages of compactness and low cost. Principles of all commercial bookkeeping can be taught on these inexpensive machines.

Low-cost Burroughs Calculators are used by hundreds of schools for training operators to qualify for business employment and for simplifying the teaching of business arithmetic.

Available in over 200 models, Burroughs adding machines—with the famous Short-Cut Keyboard—are the standard in business, and consequently are ideal for classroom instruction.

OFFERS A COMPLETE LINE OF MACHINES FOR THE CLASSROOM

Suggested Plans for Office Machine Courses

The practical application of office machines to classroom curriculum, as treated in the newly issued booklet, *Instruction Projects in Office Machines*, is based on the most modern practices used in schools today. The booklet is written so that superintendent, principal, and teacher can obtain a clear picture of the requirements for the type of curriculum they desire. An outline of the contents follows:

1. ***SHORT PRACTICE PROJECTS FOR GENERAL MACHINE ACQUAINTANCE***—A logical starting point for most general machine courses.
2. ***FULL TRAINING COURSES FOR SPECIALIZED VOCATIONAL SKILLS***—While utilizing same equipment as first type, these are designed to give the student vocational skill in machines and their applications.
3. ***INTEGRATED OFFICE PRACTICE COURSE***—By simulating actual transactions and procedures of a going business, this type aims to provide pre-employment experience as well as to co-ordinate previous training.
4. ***PRINCIPLES OF BUSINESS ARITHMETIC APPLIED MECHANICALLY AS IN BUSINESS***—Stimulates student to learn business arithmetic, while acquiring proficiency on a very commonly used machine.
5. ***BOOKKEEPING PRACTICE COURSE APPLIED MECHANICALLY AS IN BUSINESS***—Reviews principles of bookkeeping, provides basic machine knowledge, and simplifies transition of student to actual office work.
6. ***COMMERCIAL TEACHER TRAINING IN FULL SEMESTER AND SHORT SUMMER COURSES***—Gives student, or employed teachers the background necessary to instruct students properly in office machine operation and applications.

Ask to see a copy. Call the Burroughs office near you, or write

BURROUGHS ADDING MACHINE COMPANY

6297 Second Blvd. **Detroit, Michigan**

ATTENTION!

Due to the nature of its contents, *Instruction Projects in Office Machines* is intended for distribution primarily to presidents, board members, superintendents, principals, and commercial department heads. Copies to them are gratis.

FOR CLASSROOM INSTRUCTION . . . . . .

Burroughs Typewriter Computing and Accounting machines write a complete invoice in one operation and can be used for training students on all bookkeeping, billing and accounting.

Today, increasing importance is being placed on machine vocational training and general machine acquaintance courses. Due to their wide business usage, Burroughs machines are selected by the majority of schools for this work. A complete range of over 400 models offers assurance of finding *exact* equipment wanted for small or large schools, while the machines' flexibility permits their use on several different applications, thereby increasing their utility and economy. Investigate today.

Burroughs

FIRST CHOICE FOR BUSINESS OFFICE AND CLASSROOM NEEDS

Standard in business for more than fifty years, Burroughs has naturally become first choice for School Board and Business Office needs and for Classroom Instruction. Below are pictured typical Burroughs installations in different types of educational fields.

SCHOOL BOARD *and* BUSINESS OFFICE

This typical school board office handles all accounting work on modern Burroughs machines

A faster, simpler routine is obtained in this large university's business office with Burroughs

CLASS ROOM *Instruction*

Rotation on various Burroughs machines gives students well-rounded training

Burroughs is first choice in this university's machine practice classroom

Business arithmetic principles are easier grasped when students are using Burroughs Calculators

Training on Burroughs bookkeeping machines is sound basis for future vocational employment

DITTO, *Incorporated*

World's Largest Manufacturers of Gelatine and Liquid Duplicators

2265 West Harrison St., Chicago

Liquid or Gelatine Duplicators

BUILT FOR MODERN TEACHING METHODS

In modern teaching technique, Ditto duplicators are indispensable. These efficient machines quickly make ample numbers of copies of practice texts, examination questions, forms, notices, reports, lectures, maps, outlines, posters, school newspapers, etc.—anything typed, written or drawn—in one or several colors at one operation—for about 5¢ a hundred copies.

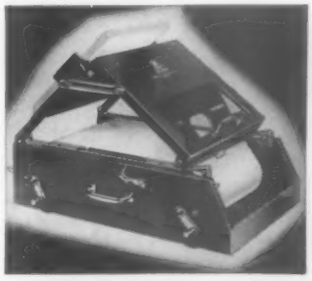
Ditto manufactures and sells both GELATINE and LIQUID PROCESS duplicators, at prices ranging from $3.95 up. Ditto representatives therefore can make intelligent, unbiased recommendations as to the machine that will best serve your purpose.

The Ditto Gelatine duplicator is famous for flexibility. It makes up to 100 bright, legible copies direct from your original, without stencil, carbon or type.

GELATINE DUPLICATORS

The Ditto R-4 Rotary — A self-feeding, self-ejecting gelatine process machine, which sets a new standard for efficient, economical operation. Operates at a speed of 70 copies per minute. Copying surface—8½ x 14″

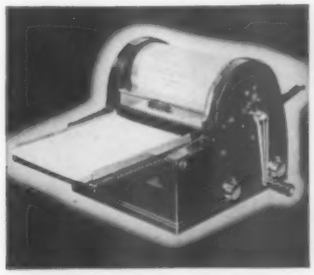
Hand Fed Rotary—A hand fed, self-ejecting duplicator that is simple to operate. Strong, lightweight, foolproof. Makes 50 or more copies per minute. Highly efficient—low in cost. Size 8½ x 14″



Portable — Low priced, hand operated, compact and flexible. Easily portable—low in initial cost and low in operating cost. Size 8½ x 13″

Film-o-graph—A teacher's duplicator. Replaces old-fashioned hectograph. Films are used over and over again. Size 8½ x 14″

LIQUID PROCESS DUPLICATORS



The Ditto D-5 — A sturdy, compact, hand fed duplicator. A table model liquid duplicator designed for school use. Contains many outstanding engineering features. Size 9 x 14″

The Ditto D-6 — A speedy liquid process rotary. Self-feeding and self-ejecting. Produces 70 or more copies per minute. Masters may be reused over and over. Copying surface—8½ x 14″

The Ditto direct (liquid process) duplicator produces up to 300 copies and makes possible the repeated use of an original to make additional copies as needed. The copies are made by direct offset from the original.

Any elementary grade child can operate either Ditto duplicator—the reason why thousands of schools are Ditto-equipped. Write today for interesting literature or free demonstration of either machine. No obligation!

THE AMERICAN SCHOOL AND UNIVERSITY

EAGLE LOCK CO.

Terryville, Conn.

General Sales Office: 26 Warren Street, New York, N. Y.

BRANCH OFFICES

521 Commerce Street
Philadelphia, Pa.

179 No. Franklin Street
Chicago, Ill.

114 Bedford Street
Boston, Mass.

COMBINATION LOCKS

The maximum of economy and security.

Automatic Locking
Not furnished masterkeyed
Simplified dialing

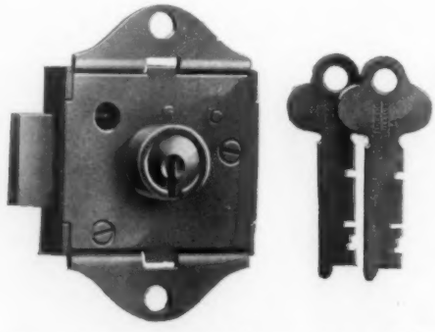
Automatic Locking
Change of combination is key-controlled
Furnished either masterkeyed or not

Automatic Locking
Not furnished masterkeyed

MANUALLY OPERATED KEY LOCKS

For use where greatest efficiency is requisite.

Pin Tumbler Construction—The type of work used in the most excellent grades of locks



Secure Lever Construction—A type of lock work that has proved its worth in years of service

Even under difficult space and light conditions the simple and positive operation of inserting and turning a key reduces delay to a minimum.

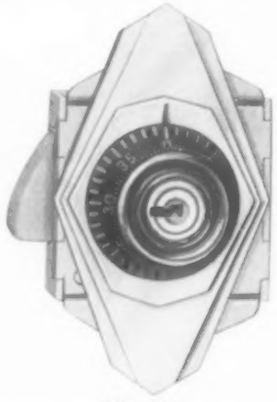
NATIONAL LOCK CO.

Rockford, Illinois

BRANCH OFFICES

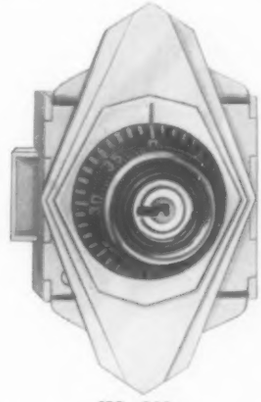
Chicago
Chattanooga
Cincinnati
Cleveland
Detroit
Evansville
Grand Rapids
High Point, N. C.
Houston
Indianapolis
Jamestown
Los Angeles
Martinsville, Va.
Milwaukee
New York
Portland
St. Louis
St. Paul
San Francisco
York, Pa.
Toronto, Ont.

ROCKFORD COMBINATION LOCKER LOCKS are available for standard Steel Lockers of any style or make. It is the complete line assuring the utmost in security, convenience, simplicity and durability. Rockford Locks have proven their worth in hundreds of Educational Institutions. For simplified and complete supervision and control select the Rockford Line.



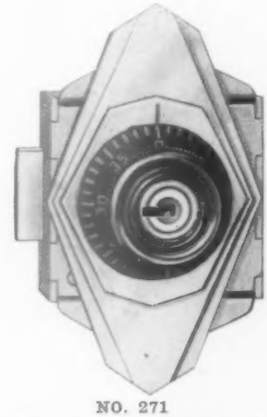
NO. 267

Master Keyed Combination Self Locking, for use on Lockers having spring latch bar. Over 64,000 different combinations available. No bolt or rivet heads visible from outside. Can also be furnished without Master Key feature.



NO. 269

For use on Box type Lockers having no latch bar. Lock has beveled spring bolt. Closing door locks lock and spins dial concealing last figure of combination. Furnished with or without Master Key feature.



NO. 271

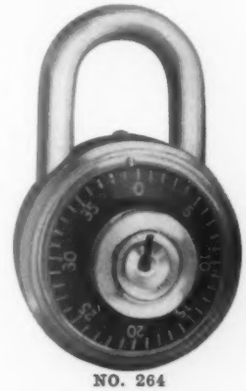
Master Keyed Combination Dead Bolt Lock having square end dead bolt. Lock does not have self-locking feature. Combinations of this lock and Nos. 267 and 269 can easily be changed by removing escutcheon plate and turning dial.

NO. 265

COMBINATION SHACKLE LOCKS

Keyless Combination Self-locking Shackle Lock that is fool proof, secure and durable. Inserting shackle upsets combination by turning dial. Must be completely re-dialed to open. Over 64,000 different combinations available. This is a very popular lock in the Rockford Line. Lock case is Chromium Plated and dial is black with white figures.

Master Keyed for ease and convenience of supervision. Can be Master Keyed with all built-in Locks shown above, or Laboratory Lock shown below. Students operate lock by combinations, while officials gain access by use of Master Key. Dial is locked against rotation when shackle is open.



NO. 264

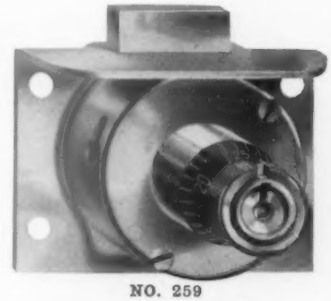
NO. 2600

NO. 2600
KEYED LOCKER LOCK

A manually operated Key Locker Lock of lever tumbler construction. Sturdily constructed of Steel and Brass. Over 15,000 possible key changes available. Can be Master Keyed if desired. Cylinder furnished in various lengths for heavy or light doors.

NO. 259
COMBINATION DRAWER LOCK

Combination Master Keyed Laboratory Drawer or Door Lock. Combination can quickly be changed without removing lock from mortise. Lock is of Solid Brass construction and is not affected by ordinary Laboratory fumes and acids. Lock is reversible for use on right or left hand doors.



NO. 259

Illustrated here are only a few of the many School Locks available in the Rockford Line. Ask for illustrated folder showing complete line.

THE YALE & TOWNE MFG. CO.

TRADE YALE MARK Stamford, Conn. TRADE YALE MARK

INTRODUCE true economies, maximum security and increased efficiency in locker rooms with these Yale Combination Locker Locks. They supply a degree of protection heretofore unavailable in locks of this type for locker use; security which discourages temptation, aiding in character development. Large easily read dials simplify operation, and minimize congestion and delay in locker rooms.

FOR ALL MAKES AND ALL TYPES OF STEEL LOCKERS

FOR NEW LOCKERS AND FOR REPLACEMENT OF WORN OUT LOCKS ON OLD EQUIPMENT

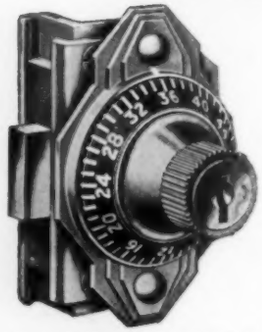
Exclusive Yale Features:

Maximum Security: Combinations dialed on three positive numbers. Combination must be known and cannot be located by manipulating dial.

Combination Disperser automatically upsets combination as lock is locked. A double safeguard. Acts as a defense against tampering.

Combination Changeable with every change of locker occupant—without removing lock from door. Feature secluded in back of lock in same secure manner as in Yale Bank Locks.

Supervisory Control of a group of lockers or the collective groups of a city school system obtained by the **Yale Emergency Key Control.** The key used is assigned exclusively to these locks.



For Lockers with Automatic Bolt Release Mechanism. Automatic Self-Locking Vertical Sliding Bolt. A New Locking Principle.

Emergency Key Controlled

No. L3374-CM, Cadmium finish
No. L3374-DZ, Chromium finish

Dial Operated Only

No. L3364-CM, Cadmium finish
No. L3364-DZ, Chromium finish

For Steel Compartment and Box Type Lockers. Beveled Spring-bolt, Automatic Self-Locking.

Dial Operated Only

No. L3369-CM, Cadmium finish
No. L3369-DZ, Chromium finish

Emergency Key Controlled

No. L3379-CM, Cadmium finish
No. L3379-DZ, Chromium finish

For Lockers with Gravity Type Locking Device. Dead Bolt Manually Operated.

Dial Operated Only

No. L3368-CM, Cadmium finish
No. L3368-DZ, Chromium finish

Emergency Key Controlled

No. L3378-CM, Cadmium finish
No. L3378-DZ, Chromium finish

NEW YALE COMBINATION PADLOCKS

FOR BASKET LOCKERS AND ALL OTHER TYPES AND MAKES OF STEEL LOCKERS

The finest and most secure combination padlocks yet produced

No. 589 Master-Key Controlled Dial

Same features of maximum security and automatic combination disperser as the above built-in type.

No. 579 Lock, Dial operation only.

No. 589 Lock, Dial operation with emergency key, provides supervisory control of lockers. May also be used with any of above built-in types under same control key.

These padlocks have ¼" diameter steel shackles, Combinations unlimited.

No. 429 Lock, Dial operation only. A highly secure medium priced padlock. $\frac{9}{32}$" diameter shackle. Combinations unlimited.

Above padlocks have Yale Visible Rotating Dial with forty-eight white graduations and numerals contrastingly indented upon black enamelled dial. Simplified operation. Faster, accurate dialing.

No. 429 Dial Operated Only

SECTION IX
CAFETERIA—HOME ECONOMICS—DORMITORY

HOW PROPER BUILDING DESIGN AND EQUIPMENT CAN LESSEN THE PROBLEMS OF RESIDENCE HALL MANAGERS

By MELISSA HUNTER

Director of Dormitories, and Head of Institution Economics, School of Home Economics, Oregon State College

THE well-planned and efficiently managed residence hall is an economic asset to any college or university campus. The problems of management of residence halls are many and complex. They begin when the idea of the building is conceived and continue on through the life of the institution. The plan for a residence is more complicated than for the regular classroom building and needs careful consideration to eliminate as much inefficiency in management as possible. Proper building design with careful selection and placement of equipment can aid materially in lessening the difficulty of administration of this complex residence hall organization.

The Right Plan for the Building's Occupants

When a residence hall is to be constructed, great care must be taken to draw up the right plans for the buildings. Mistakes at this time, in arrangement of sizes and locations of rooms, may mean inefficient management and expensive supervision for the entire life of the hall. The right or wrong plan will determine in a large measure the degree of success or failure of the business.

In drawing up these plans there are several things which the architect and the residence hall manager must keep in mind. Residence halls are built to be lived in by human beings. Personality problems can be one of the most difficult of management problems. Poorly arranged space in rooms may be just aggravating enough to develop serious difficulties. Anything that will add to the comfort of the student and reduce irritation and friction between himself and the management lessens the problems of administration just that much.

Comfort and Convenience

When a student offers himself to an institution for four years of his life and may be compelled by the institution to live in a residence hall, the surroundings should meet the needs of the life to be lived in the hall. The student rooms, in particular, should be planned to accommodate the students who will occupy the rooms. It is very necessary that the architect know the types of students on that particular campus. He should have some knowledge of what possessions the average student will bring with him in order to determine the kind and amount of storage space needed. The room or rooms in the residence hall will be the student's home for four years. Therefore it would seem that he is entitled to adequate space for his belongings. When he is comfortable and happy, the manager's problems are less. Clothes closets, wardrobes, chests of drawers, should be designed to store his possessions and not built to fit what somebody thinks he ought to bring.

Bookshelves should be designed to fit the books and notebooks used by generation after generation of college students. Study tables and desks must have drawer space wide enough and deep enough to be of use in the storage of supplies of ink, paper and other such desk material. A desk drawer just deep enough to accommodate the ink bottle without the stopper can be a source of much aggravation to the "high-geared" college student. Clothes closets for women must store dresses of many college generations. If dresses are in the short-style period when the blueprints are being drafted, the architect must remember that Dame Fashion is fickle and clothes closets are not accordions to be pulled out or folded up with

the length of a woman's skirt. A woman does not object to her dress sweeping the floor if she is wearing it, but she will be unhappy if it sweeps the closet floor. Closet space must be provided to take care of the long dress as well as the short one. All closets for storage should have good ventilation and be equipped with lights.

All people, both men and women, like to see themselves in a full-length mirror, so one in each room will give a pleasing effect. The lighting of the student room must be adequate for studying and relief from eye strain, and diffused as evenly as possible throughout the room. There should be outlets for floor and desk lamps.

Storage Room

In planning for storage it is necessary to remember that students have much sport equipment, such as tennis racquets, golf clubs, roller skates, riding boots and other such articles. Lack of space will not prevent the student from bringing them. The manager may as well forestall arguments by providing convenient space for these things.

If student rooms do not include space for storage of luggage, regular storage rooms for this must be provided. Most students wish access to their pieces of luggage. The problem of supervision is less if the storerooms are equipped with lockers, each student having his own space and access to his belongings at all times with a feeling of security from theft.

Laundry—Plumbing

Many students of both sexes do some of their laundry. If well-equipped laundry rooms are located on the same floor as the student rooms rather than in the basement, the students will not be tempted to do light laundry in their rooms or in the bathrooms. The laundry rooms can be better managed if the tubs, driers, pressing boards and irons are conveniently located. The rooms should have good ventilation, adequate light, temperature control and no fire hazards.

The manager can lessen her problem of management, cost of installation, and upkeep if the architect will locate bathrooms and other plumbing in tiers throughout the building. Shower-rooms must be waterproof, and the lead or copper pan should extend under the dressing rooms as well as the shower compartments. Materials used for walls and floors must withstand moisture and be easily cleaned, sanitary, durable, and pleasing in appearance. Very attractive color combinations are apt to encourage students to take better care of the rooms. Lavatories with spring faucets will prevent overflow of basins. Floor drains should be low enough to be efficient even if the building settles a trifle.

Kitchenettes—Mail and Packages

Small kitchenettes on each floor will be very much appreciated, especially by women students. These should be equipped with small cooking utensils, electric or gas plates, dishes, silver and small tables. An arrangement of this sort should discourage the preparation of refreshments in the student rooms and help to develop a spirit of friendship and hospitality.

If mail, parcel post and express packages are delivered at the hall, a safe and accessible place must be provided where these articles can be received and distributed without too much confusion and cost of employment. Letters and packages are always of great interest to the student, and mail time is usually an event. The regular post-office type of letter boxes are very satisfactory and safe for letters and papers. Much time can be saved in handling the mail, and the student can come for his letters at his own convenience. Some provision must be made to take care of packages, dry cleaning, and laundry, which the student sends to commercial establishments. It is the responsibility of the manager to see that each person gets his own property and that nothing is lost or stolen. Adequate and accessible space must be included in the plans to take care of this activity.

Social Life—Entertainment

During the four years in college, the average college student engages in an active social program. His social activities are very important to him, and nothing is more irritating than failure to get his telephone calls. The ideal telephone system would be a telephone in every room. Most managers find this system too expensive for the rates the student can pay. The next best thing is to have a telephone on each floor, located in a booth to insure privacy. A signal system to all rooms, with telephone calls coming over extensions in the office, should insure students' receiving their calls, and should obviate noise of ringing telephones on the floor or loud calling in the corridors. The type of system to be used must be decided upon when the plans are being drafted.

No plans for social rooms can be made until one knows the use which will be made of them. If large social lounges are needed for dances, formal teas, and group entertainments, then plans for these functions must be kept in mind when designing the social rooms. Floors must be selected from materials and finished to stand up under dancing. If large rugs are used, quality and sizes that can be rolled and moved easily should be selected.

The same is true of furniture. The manager may as well eliminate a lot of worry in the beginning by selecting furniture and furnishings that will endure hard usage and can be moved about when the rooms

Some of the residence hall facilities of Oregon State College

At left—This large reception room in Margaret Snell Hall can readily be used for dancing by the removal of the furniture and rugs

At right—Memorial Union dining service kitchen, showing pastry unit in relation to main cooking units on right

At left—Dormitory kitchen, Waldo Hall, with its compact and efficient arrangement of equipment

must be cleared for dances. When selecting arm chairs and davenports, one must remember that people will sit on the arms, and therefore only those built to stand this strain should be purchased. In the matter of upholstered furniture, a manager will do well to select fabrics with short naps, and with few long threads and loose weaves. Nervous people pick at the threads, and long, sharp finger-nails on a nervous person can soon cut many threads. Tassels and all such ornaments on furniture are also temptations for some one to twist them out of shape and cause them to become worn out and to look unbecoming in a short time.

Students as a rule do not use the large social rooms to any great extent for entertainment of personal callers. They much prefer small social rooms or alcoves where they can visit with less disturbance or observation. This attitude is quite natural and should be taken into consideration when plans for social rooms are being made. Two or three small informal rooms will add greatly to the happiness and contentment of the students, and will lesson personality problems and decrease friction and criticism.

Food Service

Probably the greatest problem of residence hall management and one of the most expensive departments to equip is the food service unit. Here the architect and manager must plan carefully in order to insure efficiency and eliminate waste of time and energy of the employees. The rooms making up the culinary department will be the dining rooms, kitchen, all auxiliary rooms for preparation, service, dishwashing, refrigeration, and storage of food and supplies. If possible, these rooms should be on the same floor and adjacent to each other to save time in preparation.

The dining room should have an impressive, attractive entrance, accessible to the students. The floor space should be adequate to prevent crowding of tables and chairs. The tables should seat no more than six or eight people if table conversation is to be participated in by all. Walls, floor and ceiling should be so constructed as to insure a quiet, restful room. Everything should be planned to induce rest, relaxation, happiness and good conduct on the part of the students.

The kitchen and auxiliary rooms must be arranged to afford the best possible light and ventilation. The floors should be as easy on the feet as possible and have floor drains sloped so that water from scrubbing will drain off despite the settling of the building. Every effort should be made to insure sanitary, healthful working conditions for the employees. This is merely good business. It seems foolish to hire a person to do a big job and place him in an atmosphere that decreases his efficiency. Walls and floors should meet in rounded corners and base, and all square corners to walls should be covered with metal strips or angles to prevent injury from moving pieces of equipment, such as hand trucks.

Facilitating the Work

The equipment layout should be arranged so that the work flows along in a straight line, thus eliminating "criss-crossing" of employees' paths. Noise from motor-driven machines in the kitchen and clatter of dishes should be controlled as much as possible. The dishwashing machine must be located so the noise cannot be heard in the dining room. Operators should not have to stop their work during dining-room service, and the guests in the dining rooms should not be annoyed by unnecessary noise.

All working space, arrangement of equipment, and heights of working areas should be carefully planned to insure ease of performance of work and decrease fatigue. Food odors must be controlled so that the dining room and other parts of the house will not be contaminated. Nothing is more unpleasant than the lingering odors of yesterday's soup and fish dinner.

Adequate storerooms and refrigeration space should be provided adjacent to the kitchen, if possible. If frozen fruits and vegetables are to be stored, space for this new-style pack must be included in the refrigeration set-up.

The service entrance must not be overlooked in the plans. It should be located convenient to the storerooms if possible, to insure economical handling of supplies.

All residence halls should be equipped with service elevators for efficient and easy handling of trunks, other luggage, furniture and articles too heavy to carry upstairs. If there are no passenger elevators, the stairs should be easy to ascend so that students will not object to having rooms on the upper floors.

Waste chutes, fireproof and metal-lined, should lead into waste rooms equipped with an automatic sprinkling system in case of fire. Clothes chutes for soiled linens may expedite the work of the maids. Adequate cleaning closets with sinks should be conveniently located on each floor.

Plans for construction and furnishing of the residence hall must not be so elaborate that the cost of upkeep will be all out of proportion with the per cent of income allowed for maintenance. Before plans are completed, a careful estimate of costs must be made to see if the rates to be charged for room and board will be adequate to carry the business as proposed.

It is easy to conclude that proper building design and careful selection and arrangement of equipment can lessen greatly the problems of any manager who has charge of a residence hall.

PLANNING KITCHENS FOR RESIDENCE HALLS

By MARGARET E. TERRELL

Director, Dining Halls and Residences, University of Washington

THE college residence hall is a large household where good food, well prepared and nicely served, has proved to be a very important factor. It aids in maintaining physical fitness and well-being and also helps to create fine morale. Not the least of its values is that it contributes to the establishing of good food standards and habits.

The first step in planning the kitchen for a residence hall is to understand the work to be performed in that particular kitchen. The amount and type of food to be prepared, the kind and amount of labor available, and details of the organization of the work, all affect the choice of equipment necessary, and its placement for the best routing of work and the requisite work space allowance. This part of the plans should be carefully studied and outlined by the food service manager before the architect has put pencil to paper. The best result is rarely secured through plans made by a manager who knows only her own kitchen, or by an architect who is unfamiliar with the details of kitchen functions. An awareness of conditions developed through numerous consultations, and the experience of seeing many kitchens and observing the success of their operations, insure good results.

There are few situations where thoughts of economy are not of dominant necessity, and everywhere wise choices and expert planning will make it possible to secure the most for the money allowed. To select equipment efficiently, one should know values and be familiar with the equipment on the market, giving thought to use and initial cost and also to cost of operation, daily care, and depreciation or upkeep, which may entail expensive parts and servicing. In planning the kitchen layout, saving on labor or routing work for efficiency is a prime consideration, but arranging equipment to economize on installation cost will not often interfere with an efficient work plan. Gas and steam lines, plumbing, hoods over cooking equipment, the ventilation ducts and drains under steam equipment, should not claim more than their share of the initial kitchen cost.

Working in beautiful, orderly surroundings gives much satisfaction and stimulates a high standard of work. Fine materials with a beauty that will endure and be reasonably easy to care for, equipment well constructed with smooth surfaces and nicely rounded corners, and an orderly arrangement, are points to be given attention. The residence hall is a student's home for nine or ten months of the year, and he will feel more at home and have more respect for the food service if he is allowed a glimpse of an attractive, efficient kitchen. A cafeteria breakfast served in the kitchen for late risers may require little work and give much real satisfaction to the students, especially if the kitchen is bright, clean and beautiful.

Storage Facilities

Residence hall kitchens, like other institution kitchens, are veritable food factories with general functions including the receiving and storing of raw materials, manufacture of products, and merchandising of food. The success of their storage facilities will depend upon accessibility and convenience, protection from spoilage, and protection from waste and theft.

It is important to keep outsiders out of the work units in the kitchen. Tradespeople making deliveries of supplies may be a real distraction from work and require a large space for moving bulky items. It is well, therefore, to have the storeroom near the entrance and on the same floor as the kitchen whenever the space allowance will permit. Where there is not enough space for the storage of all the supplies, provision should be made on the same floor to accommodate daily or weekly quantities of the most frequently used products. This will save steps and may also save valuable time of the higher-salaried employees who have access to the storeroom.

The protection of products in storage will require the maintenance of proper temperatures, the right degree of humidity, and air circulation. Most of the foods in common storage keep best at temperatures below 65° F., and keeping the common storage at a fairly low temperature may merely mean locating it away from the hot unit in the kitchen and the sunny side of the building and providing good circulation of fresh air. Well-planned refrigerated storage is a great asset to any food service. Because of expense it is frequently too limited in space, and because of a lack of knowledge of needs it is often not built to fit commodity and use requirements. Meats, dairy supplies, salad materials and frozen products do not have the same storage requirements, and the needs should be calculated closely on the basis of volume to be held and proper holding temperatures. A freezer-compart-

ment, where a temperature from 5 to 8° F. may be maintained, will not add a great deal to the refrigerator expense and will make possible the holding of frozen fruits and vegetables, the making of frozen salads and desserts, and the freezing of ice cubes, which may add much to the quality of the food service.

Protection from waste and theft in a storeroom will depend to a large extent upon a convenient, systematic arrangement and a simple, easy method of receiving, checking and issuing supplies. Wherever foods are bought by weight, the weights should be checked. Good scales in a convenient spot and faithfully and accurately used have been found to pay for themselves in a surprisingly short time, not alone in checking receipt of materials, but also in the issuing of supplies and in the recording of dining room and kitchen waste. Much time may be saved if the articles in the storeroom are arranged according to a specified classification, giving consideration to type, bulkiness and weight, frequency of use, and alphabetical plan.

The storage facilities should be designed for easy supervision. Common storage may be controlled through systematic issuing of supplies at designated hours and keeping it locked during the remainder of the time. Fruit and vegetable storage and refrigerators cannot be as easily controlled, and the entrances should therefore be visible to the entire kitchen or the supervisor's office, and should not be located where they will be convenient stopping places for untrustworthy employees as they are going off duty.

Food Preparation Units

All employees, regarded as a part of a kitchen organization, represent a given volume of energy. It should be the goal of the kitchen designer and manager to protect this energy for productive labor:

1. Avoid muscle fatigue from extra steps and difficult floors.
2. Eliminate nerve strain from noise and bad lighting.
3. Prevent unnecessary distractions.
4. Invigorate with good air and peaceful surroundings.

The plans for the work units should be started with the organization of work. Determine what is to be accomplished and how many are to work in each unit, and trace the work route of each individual, in a normal operation. The plan should follow a right-hand, consecutive order, requiring the fewest motions. Pieces of equipment that are to be used together should be located near each other, giving preference in the arrangement to pieces that are used most. In a baker's schedule, for example, note that the baker will start her day by checking the menu, securing her supplies from the refrigerator and common storage, and bringing them to her table. If she is making cake or bread, the work will proceed from the table to the mixer. She will weigh ingredients from the table top, drawers and shelf and put them in the mixer. She will watch the mixer operation while she is working on other things at the table. It would be unfortunate to have the mixer located back of her or several steps away as she works at the table. The dough or batter will be returned from the mixer to the scales and pans on the table. There may be occasional trips during the operation to the sink and the bun-divider. The material will move from the table to the proof-box or oven and from there to the storage rack. The baker needs a convenient sink, and it need not be large, unless she is to wash her pots and pans. Time-consuming functions requiring little skill, such as pot and pan washing, should not claim a great deal of the daily schedule of a baker who belongs to the higher wage level.

Bad floors may steal much money from the operation budget. Employees work more rapidly and do better work if they are not continually afraid of falling and are not fatigued from standing on a hard or uneven floor. Injuries from falls, for which the establishment is liable, and equipment loss through breakage, are expenses which may be reduced by having good floors. Smooth cement is always a temptation to the builder because it is considerably less expensive than magnesite or quarry tile, but the results may be far from desirable. A well-laid quarry tile floor is very durable, fine-looking and easy to care for. The hardness of tile, however, makes it more fatiguing to the employee than the less-resisting magnesite, and would necessitate the use of floor mats in work areas. The durability of magnesite is approximately the same as that of cement, but it is less slick and hard. It requires not more than the average amount of expense for care and upkeep.

Kitchen equipping is comparatively simple when the budget allowance will permit a freedom of choice in the selection of equipment and materials. Frequently this is not the case. Careful calculations must be made to determine how much is justifiable over minimum essentials. The more expensive metals, and such power equipment as dishwasher, potato peeler, slicer, mixer, etc., will be challenged and their worth and economy must be proven on the basis of improving food quality and saving in production cost (labor and material).

The stainless steels, monel, copper and galvanized iron, are the popular metals for equipment fabricated to order. Galvanized iron is the least desirable, least expensive and the most widely used where there is a restricted budget. It can be used most satisfactorily for tables, equipment framework and facing. It is not the most practical for equipment where there is likely

Fine materials deserve expert fabrication. Notice smoothly rounded edges; well-mitred corners on doors; freedom from projecting screws or bolts; carefully fitted parts and attractive design

Stainless-pipe racks furnish a good surface for large equipment, that is easy to keep clean and orderly

A dishwashing layout designed for rapid work

Photographs on these pages by courtesy of Stearnes Company

A beautiful, orderly kitchen stimulates high standards of work

Equipment of splendid material well constructed possesses a beauty that will endure

Smooth, even surfaces, convenient to use, easy to clean

Hoods for carrying off smoke and steam from cooking need not be black and dingy

A comfortable, durable, fine-looking floor, a noise-reducing ceiling, good lights and proper ventilation are important features of an efficient workshop

Vegetable-preparation equipment arranged for convenient work

Photographs by courtesy of Stearnes Company

to be a great deal of moisture, such as sinks and steam-table pans, because the rusting of the metal will cause a high care, repair and replacement cost. Stainless metal for the sinks and copper for the steam-table pans will prove more economical over the normal depreciation period. Stainless metal should be used for the fabricated equipment in as large quantities as the budget will permit, in order to have a durable, bright, pleasant, easy-to-care-for workshop and a kitchen that will appear clean and attractive to those for whom it is catering.

Minimum equipment essential in a dormitory kitchen includes stoves, tables, ovens, racks and sinks. The particular situation will determine the wisdom of purchasing additional equipment. If the situation is one where a given amount of student labor must be employed and at low cost, a dishwasher and a potato peeler may not be necessary. The following information, which is the result of studies and experience, will aid in deciding on the equipment needed:

Dishes washed in a machine have a lower bacterial count than those washed by hand.

A dishwashing machine may save the labor of from one to two people, depending upon the load, required size of machine and schedule of service.

One hundred pounds of potatoes may be peeled in a machine and completed by hand in 37 minutes, while an equal amount peeled entirely by hand requires about 105 minutes.

Greater uniformity of slices and about a fourth more servings may be secured by using a mechanical meat slicer.

A mixing machine may increase the volume of the mix from 5 to 25 per cent, as well as insure greater uniformity. It will also reduce the labor of production.

When selecting the kitchen equipment, the buyer should base her judgment on:

1. The comparative efficiency of the machine's operation.
2. A record of the durability and upkeep of similar machines in use.
3. The probable permanence of the firm and the model of the machine. It is usually expensive to secure repairs for an obsolete machine.
4. The quietness and convenience of operation.
5. Safety features.
6. Appearance, maintenance and ease in cleaning.
7. Space requirement.

A comfortable, efficient workshop will be quiet, well-lighted, airy, and free from unnecessary distractions. A physicist can state the amount of light required, and the lights should be so placed as to fall on the work without glare or shadow.

A frequent distraction to workers is caused by a worker from one unit going into another unit to use equipment. A typical example would be the use of one mixer by the cook, baker and salad maker. The mixer should be so located that the cook and salad maker can easily use it without going into the baking unit or interfering with the baker's work.

Service Units

The quality of the food may be maintained or marred by the service. It is the function of the serving unit to get the food to the resident with enough dispatch to prevent depreciation of the food, and in such a manner as to enhance its appeal. Distance, causing extra steps, inadequate equipment, making it impossible to serve rapidly, obstructions in the path of the service, and cross traffic which makes special precautions necessary, are among the most frequent causes of slow service due to poor kitchen planning. The service, like the other kitchen functions, should follow a right-hand order without extra motions. The kitchen designer should have in mind menus to be served, space requirement for quantities needed, and the path a waitress would have to follow in the course of serving a meal and depositing the soiled dishes. The dishwashing unit, which is likely to be both noisy and unsightly, must be in the waitress's line of traffic, but where the least possible noise will reach the dining room.

The meal hour is the peak-load hour of the day. Each employee must work a little faster, and under speed and tension there is a greater likelihood of mishaps. Plan the serving unit for quick, easy supervision. This will mean orderliness and system, and freedom from unnecessary obstructions.

The person making kitchen plans should mentally perform the duties of the workers in each unit. The success of her kitchen will correspond in a large degree to her success in the organization of work.

THE CENTRALIZED CAFETERIA DEPARTMENT OF THE CLEVELAND HEIGHTS SCHOOL SYSTEM

By MARY FARNAM

Director of Cafeterias, Cleveland Heights Board of Education, Cleveland Heights, Ohio

THE Cleveland Heights School cafeteria system differs from that of most other cities because each of the twelve schools in the system has its own cafeteria—a self-supporting unit of the whole department. The same basic plan is used for each cafeteria in order to complete the pattern of the centralized system.

Cleveland Heights is an entirely residential city, with a population of approximately 55,000. There is one high school, three junior high schools, and eight elementary schools. At present the cafeterias are divided into four geographic units, with a high school and two elementary schools composing each unit. Experienced Home Economics graduates act as managers, replacing the untrained managers who were formerly in charge. Under this plan, each cafeteria, regardless of size, receives expert Home Economics management, which, because of the small volume of business in the smaller schools, would not otherwise be possible.

The compulsory attendance rule for the cafeterias was lifted by the Board of Education, and the length of the lunch periods varies from 45 minutes to an hour and a quarter. Yet since the beginning of the new system the average number served daily has increased steadily. This reflects the appeal of wholesome foods of good quality, low priced and served in attractive surroundings.

The factors on which the success of the present system depends are: first, and in my opinion the most important, personnel and organization; second, the food materials purchased for use; third, the equipment purchased, how it is used and cared for; fourth, the menu combinations offered daily and over a period of time; fifth, the preparation and service of foods; and sixth, the cost control and the records kept to show the financial side of the picture.

Personnel and Organization

The Board of Education gave the Director free hand in selecting employees for all jobs throughout the staff. With the exception of the Home Economics graduates who were employed as managers, the employees chosen were former employees selected on their past experience record and their willingness to cooperate with the new organization. They have kept their jobs because of ability and merit. This begins the pattern of the organization. The system is small and each employee feels a pride in her position and knows she is an essential part of the whole. This prevents suspicion and petty jealousies. Cooperation with the other employees is encouraged because all full-time employees start work at the same time and no one leaves until everyone is finished. They are paid by the week. If one employee finishes ahead of time, she helps someone else finish her work. Work schedules are made out for each employee, so each one knows what her duties are as well as those of the other employees, and thus misunderstandings are avoided. If all the work is completed ahead of time, everyone leaves ahead of time. All overtime is paid on a prearranged schedule.

Cash bonuses are paid to each employee each month that the school's report has shown no deficit. As a result, the employees know at all times the financial status of their cafeteria, and, because their efforts make or mar the success of the cafeteria, each one does her best to assume her share of responsibility. The managers also receive a basic salary and a bonus, which stimulates their personal interest in the success of the cafeterias and their employees. Through the cooperation of the Board of Education, a free 21-day hospitalization plan, at a very small monthly charge, is available to all employees and members of their immediate families. Last year, a state retirement pension system became a law, which affords added personal protection. This formerly applied only to teachers and members of the educational staff. As a result, there is an extremely low turnover among the regular employees.

The Director interviews and hires all the employees. They are assigned to the various cafeterias, where they become directly responsible to the manager. If any employee's work is unsatisfactory, the situation is discussed, by the employee and the manager, in the Director's office, and if no future improvement is shown, the employee is dismissed by the Director.

A free medical examination is required of all employees before beginning work and at periodical intervals afterwards. White uniforms are furnished to all the regular employees, and white bib aprons are supplied to all student employees.

The manager selects the pupil employees from the boys and girls sent to her by the principal of the school. Before beginning work, however, each child must return a work permit slip, signed by both the principal and the parent. This precludes any misunderstanding. There is no stigma attached to working in the Cleveland Heights School cafeterias; on the contrary, it is considered a privilege. In some schools, merit points are given the students who work in the cafeterias, just as for any other school privilege job. As a result, we always have a waiting list of students. Thus the personnel that sets the background for this cafeteria system.

Purchase of Food Materials

Good food is always the best seller. School children do not need or want rich and fancy food but, in any event, it cannot be too good. Therefore, we buy only the best-quality food materials available and suitable for our needs.

Milk, ice cream, butter and eggs, bread, candy, and paper goods are purchased from bids sent out from the cafeteria office each semester. The returned bids are checked, the materials tested, compared and sampled, and the plants of the bidders visited to inspect sanitary conditions. Bids are awarded based on the best price and quality to suit our requirements. However, we do not necessarily take the lowest price. Although the prices for staples do not hold for a semester, bids for these items are also sent out, and when returned are checked and kept on file in the cafeteria office. Each dealer is required to keep the office notified of the price change of any item in order to keep our cost files up to date. Bids for meat, fresh vegetables and fruits are sent out each week, because of the great fluctuation in the quality and price of these items. Friday of each week, the managers are notified from which dealer to order these items the following week. Canned goods are bought on future and stored by the dealer to be sent out to each cafeteria when ordered by the managers.

With this system of food purchase, and because of the total volume of business for the entire cafeteria department, even the smallest elementary school has the advantage of maintained quality and low prices on all food used. Supplies are checked when received, for correct weight and price, quality as ordered, and sanitary condition of containers used, before the delivery slip is signed. Failure to meet our requirements is cause for cancelation of any dealer's contract. Salesmen and solicitors are not permitted to call on the managers without an appointment. This saves unnecessary interruptions as well as a great deal of time for the managers.

The volume of business, especially in the elementary schools, fluctuates with the weather, since the attendance is voluntary. A rainy or snowy day may increase the volume as much as 400 per cent. In order to meet these unexpected increases in the volume of business, arrangements are made with the successful bidder to be prepared to make special deliveries. Each school also has a well-stocked emergency shelf.

Equipment—Use and Care

The Board of Education furnished the original equipment. This is maintained, improved, added to and kept in repair by cafeteria department funds. The Director purchases all equipment by specification and bid. Standardization of equipment throughout the system simplifies and improves purchasing. In addition, equipment is interchangeable between schools when the volume of business changes from one cafeteria to another. Also, employees transferred from one school to another find familiar equipment to work with. A record is kept of large equipment to show the history of purchase, repair and replacement

Cleveland Heights School Cafeteria Department
PHYSICAL INVENTORY

_____ School

June _____ Jan. _____ **Aluminum**

ON HAND	LOSS	NEEDED	ON HAND	LOSS	NEEDED	ARTICLE	WEAREVER NUMBER	OUTSIDE TOP SIZE OR DIAMETER	CAPACITY	UNIT COST	TOTAL COST
						BROWN BREAD PAN	112	5 in.	1 qt.		
						CAKE PANS					
						Layer					
						Oblong	314	15½ x 10½ x 2¼ in.	5 qt.		
						"		"	5		
						VEG. STEAMER	965				
						" " Top		11 in.	10 qts.		
						" " Bottom		11 in.	10 qts.		
									TOTAL COST	$	
									YEARLY DEPRECIATION %	$	

In making semi-annual inventories, the various types of equipment are checked against a 29-page printed list

as needed. Physical inventory is taken twice a year. Record is made of the amount of equipment on hand, the loss since the previous inventory, and the amount of new equipment needed. A description of the article is given, and the unit price and total price given. The record is taken by groups—i.e., aluminum ware, books, china, earthenware, enamelware, glassware, equipment (stationary), furniture (dining room, kitchen, office and rest room), iron, linen, metal, silverware, steel and cutlery, tin, wood, miscellaneous—and at the end of each group section the total amount invested in that group is shown. From this record, knowing the expected life of the various kinds of equipment, it is easy to prorate the replacement and depreciation reserve. Continuous effort is made to oil, repair and maintain all equipment.

During the last five years, any surplus accumulated has been turned back into the cafeterias as rapidly as possible. In the beginning, a plan was made, for each cafeteria, of the equipment both large and small that it would be necessary and desirable to purchase when possible. Although this plan is not entirely completed, the following items have already been purchased: screens for all windows in kitchens, serving rooms and dining rooms; uniforms for all employees; glass dishes for desserts, fruit juice and salads; enamelware has been replaced by aluminum and stainless steel; electric mixers for all cafeterias; dishwashers which will take care of trays as well as dishes; glass coffee makers for teachers' service; and a start has been made to replace the ordinary heavy white china with attractive colored pattern china with a patented rim, to cut down breakage. In addition, with the cooperation of various school organizations, colorful, and attractive draperies and potted plants have been added to the dining rooms, with the understanding that the cafeteria department will maintain them.

CLEVELAND HEIGHTS SCHOOLS
CAFETERIA DEPARTMENT

WEEKLY MENU

School _____ Date _____ 193__

ITEM	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Soup					
Meat					
Meat Subst.					
Potatoes					
Vegetable					
"					
Salads					
"					
"					
"					
Sandwiches					
"					
"					
"					
Dessert					
"					
"					
"					
Hot Bread					

Mark Special Lundh Item "X"
Selling Price_____¢

Daily Standards Served:
Fruit
Fruit Juice
Tomato Juice
Milk
Coffee
Tea
Ice Cream
Ice Cream Bars
Ice Cream Wafers
Cookies
Graham Crackers
Head Lettuce
Bread
Butter
Rolls

Menus are made up a week in advance so that the cafeteria office can check them before they are used

Menu Combinations

The menus for the school in each group are sent by the manager to the cafeteria office one week in advance. They are checked and any suggested changes made before they are used. The menus are planned to meet the requirements of the children of each age group. The present plan is to keep them as simplified as possible. This lowers labor costs, lessens waste from leftover food, and over a period of time permits greater menu variety. It is said that food cost is not based alone on what is used but on what is left over. This applies to both food materials used and labor involved. We strive to set our ideals high and maintain them, although often it would be easier to let down the bars. Following the axiom "trifles make perfection but perfection is no trifle," we aim to have perfection of flavor and texture, serving foods that children need and want, using attractive methods of serving and garnishing, but prepare these foods efficiently from the best-quality materials obtainable, under sanitary conditions, in order that the final result will both attract the eye and satisfy the child's taste and appetite. Truthfulness in labeling each dish is essential. The name should explain both the ingredients used and the method of preparation. It is not fair to the child to label a dish "surprise a la" something or other, because too often the surprise would be a disappointment to the child. Hamburgers, hot dogs, pop, tea and coffee are not served. In the elementary schools no candy of any kind is sold, and in the high schools only the purest milk and nut chocolate bars are sold. These are not displayed until after the hot lunch line is ended. With the exception of graham crackers, which are a big favorite with the smaller children, all cookies sold are made in the cafeteria kitchens. In all schools daily specials are offered which are combination choices of items from the regular a la carte menu, but sold at a reduced price.

Food Preparation and Service

The cooks are furnished standardized recipes, which are cost-priced and show the number and size of servings. Standardized measuring cups and spoons,

CLEVELAND HEIGHTS SCHOOL CAFETERIAS - STANDARD RECIPE

Number Servings _____ Total Cost _____

Amount in one Serving _____ Cost per S-rving _____

INGREDIENTS	AMOUNT	WEIGHT	UNIT COST	TOTAL COST	CALORIES

8 x 5-inch recipe cards are easily filed

ITEM	UNIT COST	BAL.	Total Amount Received Weekly 1.	2.	3.	4.	Total Amount Used Weekly 1.	2.	3.	4.	Page 5 BAL.	CASH VALUE
FRESH FRUIT AND VEG.												
Apples-Box												
" Cooking												
Asparagus												
Bananas												
Beans-green												
" Limas												
Beets												
Broccoli												
Brussel Spr.												
Cabbage												
Carrots												

The weekly-monthly stock sheet

DAILY CAFETERIA [illegible] SHEET

SCHOOL _____ DATE _____ 195__

ITEM	Previous Left-overs	Prepared	Sold	Left-over	Service
Soup					
Meat					
Meat Substitute					
Potatoes					
Vegetables					
"					
"					
Bun Sandwich					
B. & B.					
Sandwich					
"					
"					
"					
Bread - White					
"					
Rolls					
"					
Butter					
Salad					
"					
"					
"					
"					
"					
"					
Dessert					
"					
"					
"					
"					
"					
"					
"					
Milk ½ pts.					
Milk Bulk					
Ice Cream					
" " Bars					
" "					
Tomato Juice					
Fruit Juice					
Crackers					
Cookies					
Coffee					
Tea					
Muffins					

These records help in determining popular foods

temperature-controlled ovens, reliable scales and thermometers, are used in the food preparation. In addition, only the highest-quality ingredients are used. This insures standard products of uniform size and quality. All food is tasted before being served. Standardized serving spoons and dippers are used at the steam tables. No food is served the second day in the same form, and therefore each time a food is served it has its original freshness, flavor, and paid-for value.

The Director visits a different cafeteria each noon to see that standards are maintained and to keep in constant personal contact with the employees, children and school principals. This is one of the greatest advantages of a small system.

Cost Control and Records

A record is kept of the cost of all employees' meals. The student employees select their lunches from the counter and sign for them in the employees' meal book at the cashier's desk. The regular employees also select their lunches from in front of the counter. They may eat whatever they wish. At the end of each month, the exact cost of the employees' meals is determined.

A perpetual inventory, kept by the managers, records everything received and used. The cash value of this inventory is figured at the end of each month for the monthly operating statement. A daily work sheet is furnished the employees in each department, showing the amount to prepare and the expected number of servings. The employees keep a daily record of raw materials used, number of servings prepared, served and left over. From these records the manager completes her daily counter sheet. These records are of great value in determining popular menu combinations, and what amount of each item to prepare the next time it appears on the menu.

Each Friday, the invoices for all purchases are checked and signed for payment by the managers and sent to the cafeteria office. These are then entered on the cafeteria department's books, vouchered for payment and sent to the Board of Education business office for issuance of the checks. All cafeteria bills are paid twice a month, and advantage is taken of all discounts offered. This procedure establishes a high credit rating, which is a good business asset and in over a year's time saves a sizable amount of money.

The daily service sheet records the weather, number of employees served, and cost of their meals, the number of paying customers served, and the amount of cash received. Checking machines were purchased which are specially constructed so that the daily sales record can be cleared only by the manager's key, and the cumulative total at the end of the month is cleared by the Director's key. Cafeteria receipts are col-

CLEVELAND HEIGHTS SCHOOL CAFETERIA DEPARTMENT

DAILY SERVICE RECORD

SCHOOL _____ MONTH _____ 195__

Date	Weather	Belle-faire	Indigent No.	Indigent Amount	Employees No.	Employees Amount	Pupils & Teachers No.	Pupils & Teachers Amount	Number Served	Misc. Receipts	Lunch Receipts

The daily service record

lected each Friday by Brinks Express. These are deposited in a special cafeteria fund of the Board of Education, instead of being included in the general fund. This is a state law in Ohio. A specified amount of petty cash is furnished each cafeteria. A petty cash book is used to record any cash purchases, and a written receipt is required for each one.

A complete operating statement is compiled at the end of each calendar month and sent to the Board of Education for approval. This gives a complete record for each individual cafeteria and the department as a whole. Each cafeteria is a self-supporting unit of the whole, and all expenses, including administrative and managers' salaries, are paid from cafeteria funds.

Each cafeteria pays its share of the administrative salaries in proportion of its sales to the total sales. In a similar manner, each manager's salary is paid by the schools she supervises. These salary charges are prorated each month as follows: the total amount of the administrative and managers' salaries for the year is divided by the number of days the cafeterias operate during the year. (Last year the cafeterias were operated 175 school days.) This figure is the amount of the administrative and managers' salaries per day. This is multiplied by the number of days in each operating period to correctly prorate these charges.

The monthly operating statement sent to the Board of Education shows for each cafeteria and the department as a whole the following information: receipts, food cost, total salaries, salary distribution for kitchen employees, managers and administration; general expense, reserve for depreciation, and surplus or deficit for the current month. Beside each cost figure appears the percentage figure for that cost. This makes it possible to evaluate correctly the various expenditures, and offers a basis for an intelligent comparison of the cash figures. After the first month in each school year, the monthly statement also gives the cumulative receipts, food cost, gross profit, total expense and surplus or deficit for each cafeteria and the entire department. Other valuable figures shown are: total number served, average check, the number of days' receipts and the number of days wages were paid, because in some months wages are paid on days when no receipts are received. These records are kept simple and usable and have proved to be efficient in giving a complete financial analysis at all times, whenever such a breakdown seems desirable.

CLEVELAND HEIGHTS SCHOOL CAFETERIA DEPARTMENT
MONTHLY OPERATING STATEMENT

	RECEIPTS	%	FOOD COST	%	TOTAL SAL.	%	KITCH. SAL.	%	MGR. SAL.	%	ADM. SAL.	%	GENL. EXP.	%	DEPREC.	%	SUR-PLUS	%	AV. CH.
TOTAL																			
High																			
Taylor																			
Cent.																			
Nox. Jr.																			
Nox. El.																			
Fairfax																			
Roos.																			
Blvd.																			
Cov.																			
Mont.																			
Noble																			
Oxford																			

Days Receipts _____
Days Labor _____
Labor per day _____
Total served _____
Av. Check _____

Each month an operating statement is sent to the Board of Education

Summary

This is the complete pattern of the organization of the Cleveland Heights School Cafeteria Department. The system is small, the organization is effective and simple, and the department is kept personalized. Having the supervision of a Home Economics trained director and experienced Home Economics trained managers, the Cleveland Heights School Cafeteria Department is entirely self-supporting, and fulfills its purpose in the community by serving wholesome food, well cooked, prepared from highest-quality materials, prepared under sanitary conditions, and attractively served at low prices to the children of Cleveland Heights in pleasant surroundings.

HOME ECONOMICS IN A PROGRESSIVE SCHOOL

By JANE WINTER LIGHTER

Head, Home Economics Department,
New Trier Township High School, Winnetka, Illinois

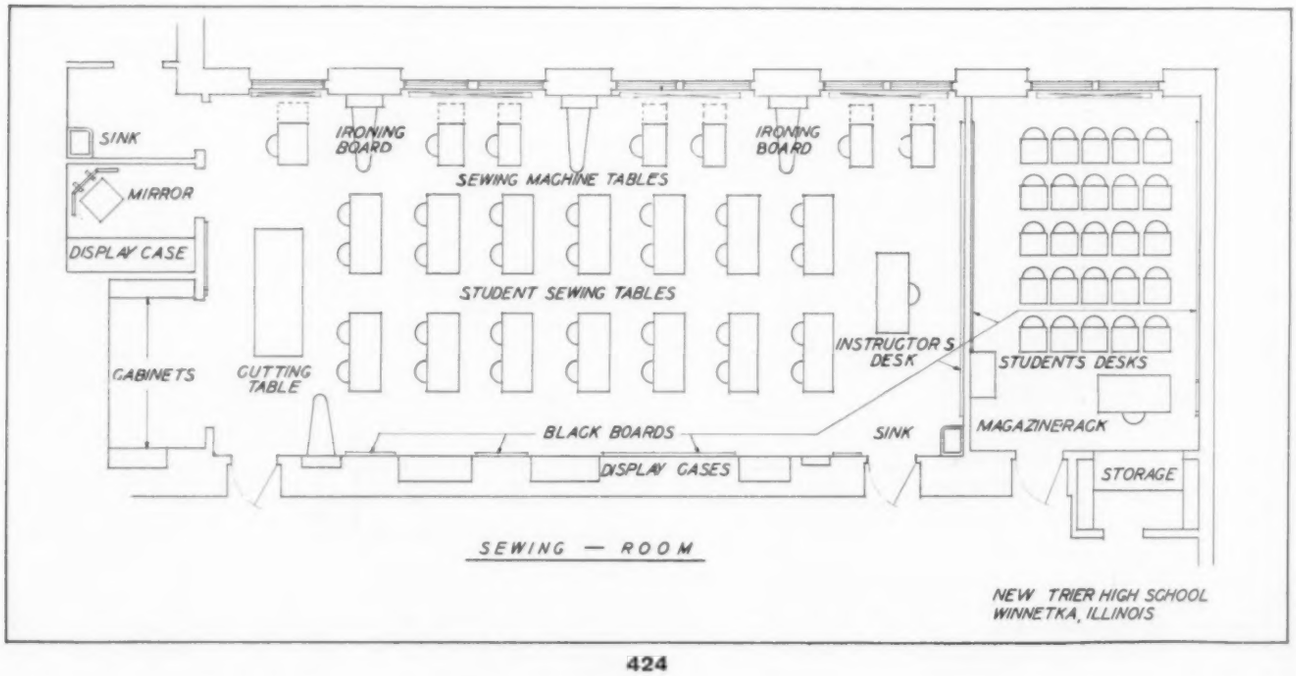
THE Home Economics Department at New Trier Township High School in Winnetka was planned to meet the immediate as well as the future needs of the community. Two of these needs, and also demands, are—a constantly changing progressive curriculum and an intensified program of activity for the students, parents and faculty. The rooms of the department are (1) the foods laboratory, (2) the clothing laboratory, (3) the interior decorating laboratory, (4) the classrooms, and (5) the living room-dining room unit.

The Clothing Laboratory

The clothing laboratory is the same size as the food laboratory and accommodates 28 students. The tables are arranged in two rows of seven, with two students at each table. Seven electric sewing machines are centered between the two rows of work tables. The seven foot-power machines are placed beside the windows. The ironing boards are on the wall spaces between the windows. These are enclosed in cases which are not as objectionable as many ironing-board cases are; they unfortunately could not be recessed, owing to structural difficulties. The room functions well for good work habits and teaching, and is also well balanced in design. The walls are ivory with a blue ceiling, henna draperies, and walnut stain on desks, chairs, and recessed cupboards. One cupboard is open bookshelves. The fitting rooms are adequate.

The Foods Laboratory

The foods laboratory is sufficiently large to have laboratory space in the main section with chairs for class discussion in one portion. The arrangement of the equipment is a combination unit-kitchen plan and standard laboratory desks. Each laboratory desk accommodates four girls, with a sink and stove as part of the group. The unit kitchens also accommodate four girls, and measure 9 x 12 feet. They are equipped with all pieces of a home kitchen—cupboards with working height 36 inches, stove, sink, and table with four chairs, for serving. Students are rotated from unit kitchens to laboratory desks. The curriculum centers around the planning of meals. The table tops and sinks are monel metal. The cupboards are painted ivory on the outside with a soft gray-green on the interior. The large refrigerator at the pantry and storage end of the laboratory is ivory. The small pieces of equipment, as well as china, silver, and glassware, carry out the color scheme. The walls and ceil-



Right—Close-up of one of the homelike unit kitchens

Below—General view of the foods laboratory. The layout makes it possible to rotate students from laboratory desks to unit kitchens

A corner of the living-dining room. This unit is used for social events as well as for class work

ing are peach, the floor green and black rubberized tile, and the draperies green. The room thus far has proved satisfactory for regular class work. We have also used it successfully for the preparation of large meals for 30 to 40 people. These dinners and luncheons were served in the living-dining room which adjoins the food laboratory. Students from experimental classes frequently prepare luncheon in the laboratory, and serve it on the individual unit kitchen tables, with additional folding tables which we keep for this use.

Household Management Rooms

The interior decorating and household management rooms are classrooms with a homelike touch. They are curtained with lemon-yellow draperies; the walls are ivory and the ceilings blue. Recessed wall niches are decorative notes, as are also magazine and book stands stained to match the chairs and desks. All the rooms have an abundance of plants, which the students care for.

The living-dining room unit consists of three rooms. The large main living-dining room is 26 x 25 feet, with a fireplace, and is furnished to accommodate groups for teas, meetings, luncheons and dinners. The furnishings were planned and purchased with the aid of the students. A cumulative Sheraton table in three sections serves to hold lamps, magazines and objects of art, and can be used for meals, in one, two or three sections. This table plus the cutting table in the clothing laboratory serves easily 30 to 40 people. Card tables are sometimes used for bridge parties.

The second room in this group is a kitchen, 12 x 14 feet, equipped with cupboards, refrigerator, electric stove, and butler's pantry. Food preparation and dish washing for the living-dining room are accomplished in this kitchen.

The third room in the group is a small room usable as a studio bedroom or a library. This is important because supplementary libraries are necessary in a school as large as New Trier. Adjoining this room is a fully equipped bathroom.

The curriculum of the Home Economics Department at New Trier is a four-year program. Foods and clothing are each one-year courses offered to freshmen and sophomores. Interior decorating and household management are also each a one-year course, offered to juniors and seniors.

The Home Economics Department integrates with the Science Department with a general science course for freshmen. Again, integration is accomplished in dramatic arts, a course designed for seniors interested in dramatics. Integration is very desirable in as large a school as New Trier. It helps the students and faculty in other departments to exchange ideas, have the use of equipment, and often opens new vistas to students who have had no opportunity to work in the household arts fields.

Our complete program, whether it be the teaching of individual subjects, the use of the mechanical equipment, or the integrating with other departments, is centered around student activity and participation. We want the students to feel that they share the department and in so doing assume responsibility for its care and efficiency.

EXCEL METAL CABINET CO., INC.

101 Park Avenue, New York

EXCEL METALCRAFT

Steel Kitchen Furniture for the School Homemaking Department

IN DESIGNING the equipment for school homemaking and foods laboratories presented in this folder, the aim has been to provide the highest standard of quality and the maximum adaptability to advanced educational practice. It is believed that through standardization of unit sizes and design the cost can be kept within the budget limitations of the average school. Experience has fully borne out this belief as increasing numbers of schools in all sections of the country are installing METALCRAFT Steel Kitchen Furniture.

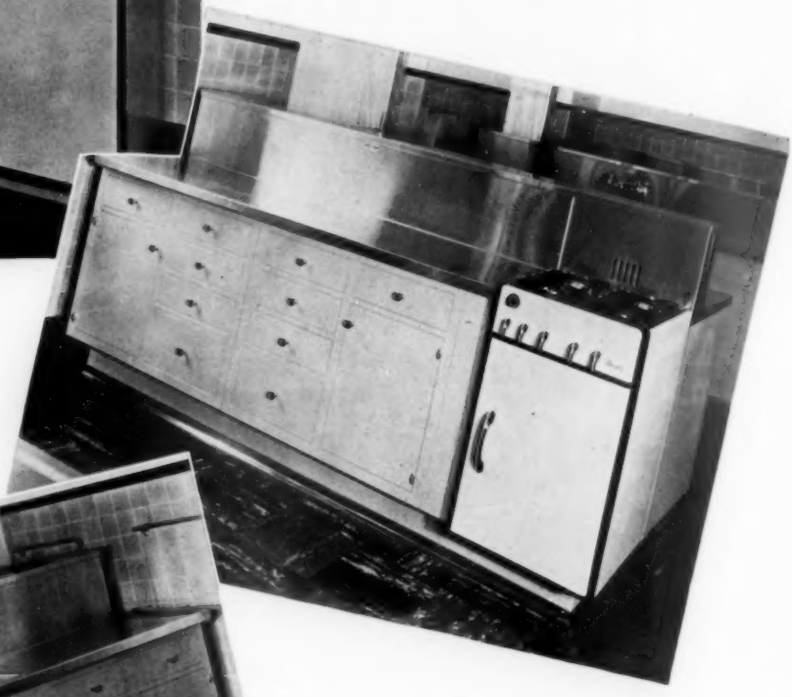
The units described on the following pages will be found serviceable for a large range of requirements whether in the one-teacher department of the small school, the homemaking cottage or the foods laboratories of the great metropolitan high school. Where special equipment is needed we are prepared to supply it, although the cost will necessarily be increased.

The services of our staff are available to architects and school officials for assistance in the planning and equipping of homemaking departments.

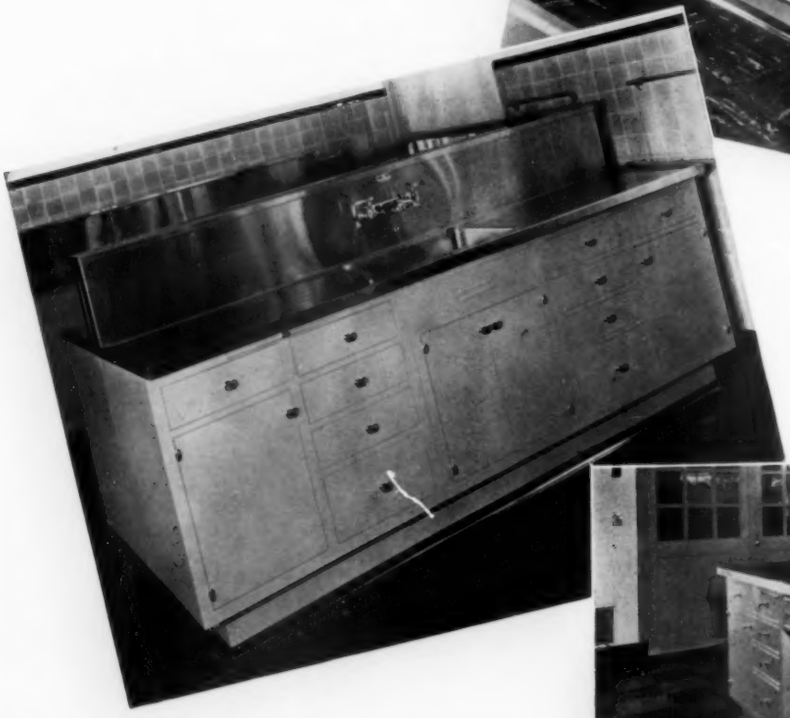
Installation of home-making equipment in Lawrence High School, Lawrence, Long Island, N. Y. Lawrence J. Lincoln, Architect

EXCEL METAL UNITS

Students' Unit — Stainless steel work top; cabinets under, with built-in Range



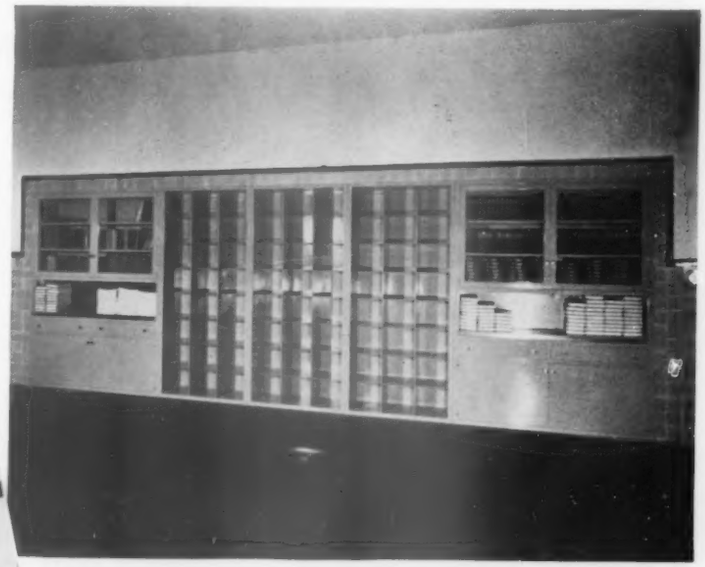
Students' Units—Back to back



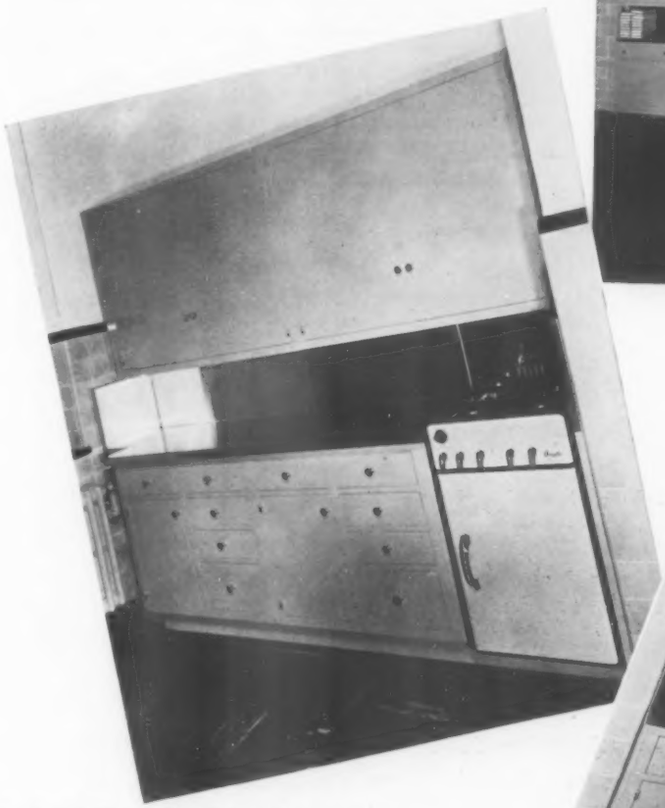
Sink Unit— Stainless steel sink and drainboard; cabinets under

Instructor's Unit—Stainless steel sink and drainboard; cabinets under

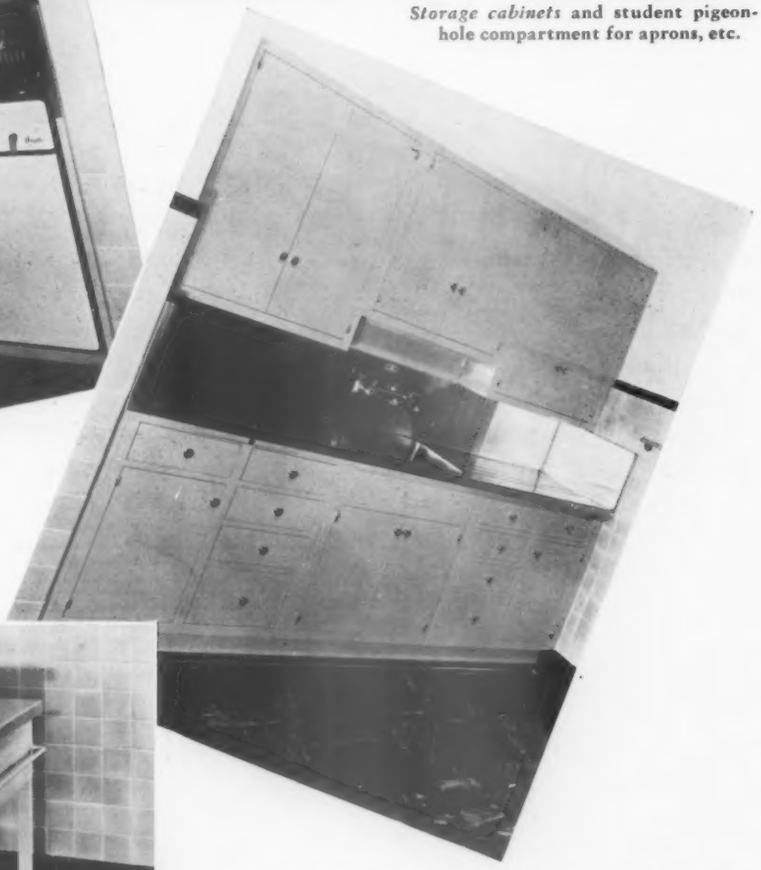
FOR SCHOOL AND COLLEGE CLASSROOMS



Storage cabinets and student pigeonhole compartment for aprons, etc.



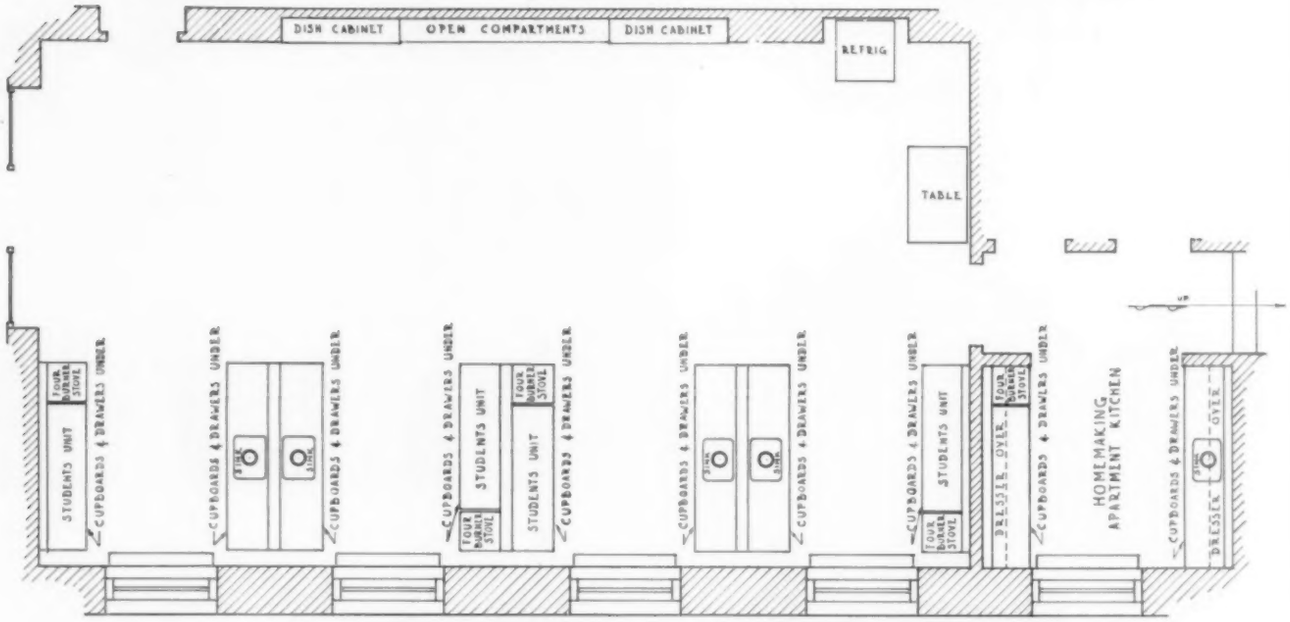
Students' Unit with dish and storage cabinets over, in homemaking apartment kitchen



Sink Unit with dish and storage cabinets over, in homemaking apartment kitchen

Table with stainless steel top and shelf; equipped with casters
(Also furnished without casters)

FLOOR PLANS OF TWO HOMEMAKING LABORATORIES



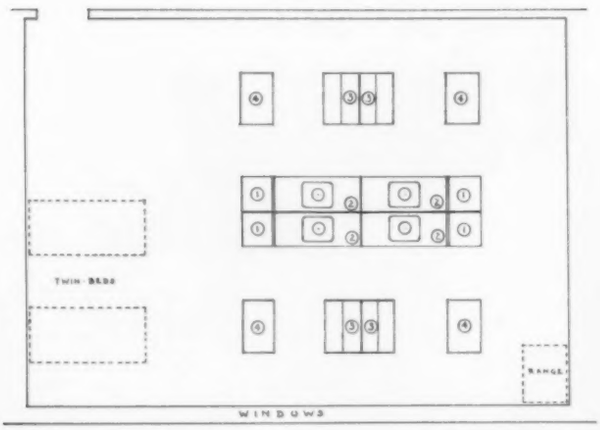
Lawrence High School, Long Island. Accommodating 20 Students

This floor plan shows the arrangement of Homemaking Laboratory in the Lawrence High School, Long Island. All the pieces of equipment shown are made up of combinations of standard Metalcraft Units.

The homemaking room is a well-planned, modern, scientifically furnished room consisting of four unit kitchens equipped with the essentials for work in family groups, four or five students working in each group. Each unit contains 1 sink of stainless steel with cabinet below, 1 work top of stainless steel with cabinet below, and built-in automatic four-burner gas range.

The apartment kitchen shown at right is equipped the same as the four units in the homemaking room.

To the left, directly off the homemaking room, there is a demonstration room used for lectures and discussion. This room contains an instructor's unit, illustrated on page 428.



Key to plan:

1—Four Burner Gas Range
2—Sink and Cabinet Assembly
3—Student Unit and Dish Cabinet
4—Work Table

This floor plan and cut below illustrate arrangement of a smaller and more economical installation in the Belmont High School, yet modern and efficient.

Belmont Blvd. School, Long Island
W. H. Spaulding, Architect

TYPICAL ASSEMBLIES OF EXCEL METALCRAFT STANDARD CABINET UNITS

Left

Sink Assembly

The sink assembly shown is 8′ 0″ long and consists of a stainless steel sink top with 8″ high back, two 30″ CD Base Units and one 36″ SE Sink Cabinet Unit

Right

Work Center or Dresser

These assemblies are made in 36″ and 48″ widths and are used as a combined Student Unit and dish closet. The counter top can be stainless steel or linoleum covered. The assembly consists of DC base cabinet with counter and DC upper section

Homemaking Apartment Unit

Consists of sink unit with two 30″ Type C and one 36″ Type B wall cabinet

Student Unit

This Assembly consists of a counter top of stainless steel with 48″ DC base cabinet. This Unit can be furnished in all sizes of our standard base units or multiples of these units. Linoleum counter tops can be supplied

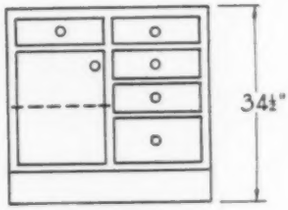
Storage Cabinet Assembly

This assembly of standard units provides adequate storage space for supplies, china, utensils, etc. By combining various sizes and types of units any desired arrangement and storage capacity may be obtained. The above assembly consists of a Type BC or SC closet on the left, a type A over the refrigerator, two DC, one DC and one CD on each side of the refrigerator. The two counter tops can be either linoleum or stainless steel

STANDARD TYPES AND SIZES

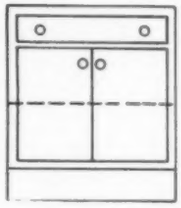
Metalcraft Homemaking Units

BASE CABINETS — 22″ DEEP

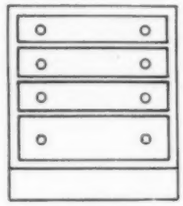


TYPE DC
36″ wide
42″ wide
48″ wide

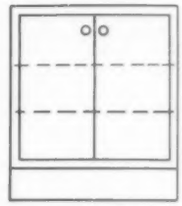
TYPE SE
24″ wide
30″ wide
36″ wide



TYPE CD
24″ wide
30″ wide
36″ wide
42″ wide



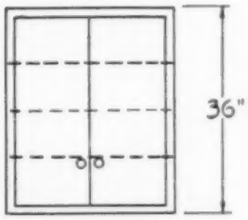
TYPE AD
24″ wide
30″ wide
36″ wide
42″ wide



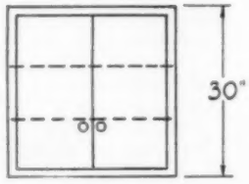
TYPE AC
24″ wide
30″ wide
36″ wide
42″ wide

STORAGE AND BROOM CABINETS
22″ deep

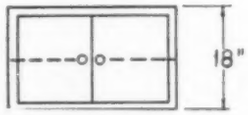
WALL CABINETS — 12″ DEEP



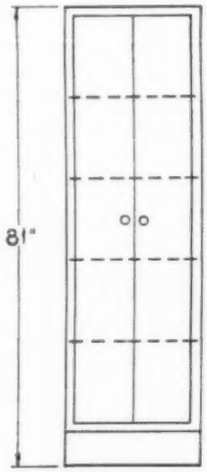
TYPE C
24″ wide
30″ wide
36″ wide
42″ wide



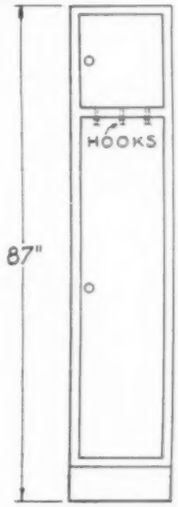
TYPE B
24″ wide
30″ wide
36″ wide
42″ wide



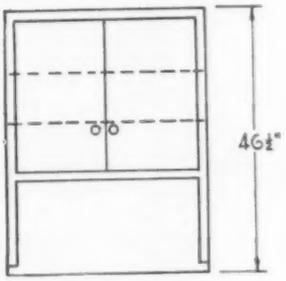
TYPE A
24″ wide
30″ wide
36″ wide
42″ wide



TYPE SC
24″ wide
30″ wide
36″ wide



TYPE BC
18″ wide
24″ wide



TYPE UC
36″ wide
42″ wide
48″ wide

Upper section used with Type DC for free standing dresser

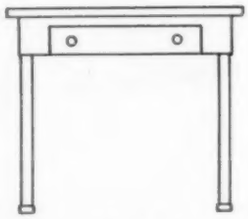
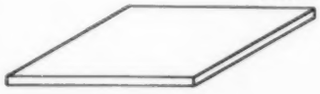


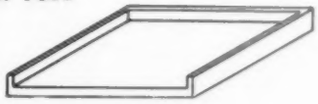
TABLE
42″ long, 24″ wide
48″ long, 24″ wide

Also furnished with casters and shelf

COUNTER TOPS



Flat Type



Ledge Type

Furnished for any size base cabinet shown or combination of sizes

SINK TOPS

Stainless Steel Sink and Drainboard

Linoleum Drainboard with Stainless Steel Sink

Sink Tops are made in any length required and constructed to meet conditions of any installation

ADAPTABLE TO ALL REQUIREMENTS

METALCRAFT Homemaking Units have been so designed that by combining the various types and sizes almost any desired arrangement may be economically obtained.

As will be noted on page 431 the recommended typical assemblies shown will answer almost every need in the modern homemaking department. The various units used to make up these assemblies are described, and on page 432 the individual unit types and sizes are illustrated.

Since there is a difference of opinion among architects and school officials as to what units comprise the most desirable assemblies, which is often influenced by the size of the budget, there are some who desire to work out their own ideas. This is made possible by the use of METALCRAFT standard individual units.

Attention is called to the fact that sink tops and counter tops are made to order and are furnished continuous in one piece in sizes to fit all units or any combination of units. A rough sketch showing desired arrangements of units in assemblies should accompany request for prices.

We shall be glad to submit suggested layout from floor plan, specification and quotation upon request.

SPECIFICATION OF CONSTRUCTION EXCEL METALCRAFT UNITS

Cabinets: Are constructed of 18 gauge furniture steel.

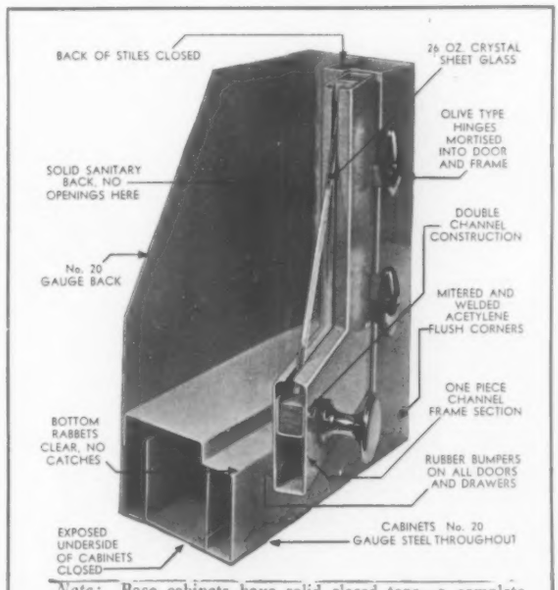
All corners of cases are mitered and acetylene welded without seams or joints forming a rigid front frame with continuous sides, bottom and back formed from one sheet of metal.

All doors and drawer openings have full continuous rabbets around all sides, connected at corners by welding, into which doors and drawer heads are recessed making a flush front construction.

Between drawers horizontally and dividing drawers or doors as required there are box channel members acetylene welded to frame members flush with face of cabinets.

Door and drawer heads are $\frac{5}{8}$" thick hollow metal construction filled with sound deadening.

All drawers are equipped with ball bearing rollers.


BACK OF STILES CLOSED
26 OZ. CRYSTAL SHEET GLASS
OLIVE TYPE HINGES MORTISED INTO DOOR AND FRAME
SOLID SANITARY BACK, NO OPENINGS HERE
DOUBLE CHANNEL CONSTRUCTION
No. 20 GAUGE BACK
MITERED AND WELDED ACETYLENE FLUSH CORNERS
ONE PIECE CHANNEL FRAME SECTION
BOTTOM RABBETS CLEAR, NO CATCHES
RUBBER BUMPERS ON ALL DOORS AND DRAWERS
EXPOSED UNDERSIDE OF CABINETS CLOSED
CABINETS No. 20 GAUGE STEEL THROUGHOUT

Note: Base cabinets have solid closed tops—a complete closed case. Base cabinets have top, bottom and side stiles forming complete rigid front frame. All hardware solid bronze—chromium plated.

All drawers equipped with ball bearing rollers

All shelves are adjustable and removable.

Soft white Para rubber bumpers are provided behind all doors and drawer heads.

Hinges are olive type solid cast bronze chromium plated, carefully mortised into doors and frames.

Pulls and knobs solid cast bronze chromium plated.

Finish: All cabinets have a filler and priming coat baked on and are then finished with the best quality synthetic enamel baked on in accordance with manufacturers' standards.

Colors of enamel: White, Ivory, Gray or Green. Special colors can be matched.

Counter Tops: Stainless steel tops are constructed of .031-22 gauge metal stretched over 16 gauge steel body heavily reinforced with channel stiffeners.

Linoleum tops are constructed of a 16 gauge body, reinforced with heavy channel stiffeners, upon which is securely cemented Armstrong's $\frac{3}{16}$" battleship linoleum. Edges of counters are bound with 18 gauge stainless steel which is rabbetted into linoleum making a smooth and flush surface. No screw heads appear on front of binding.

Sink Tops: A selection of sink tops is available and the type used usually is determined by the budget. All stainless steel tops make the best installation. Linoleum tops with stainless steel bowls and linoleum tops with porcelain bowls are available. Where the budget is extremely limited, cast iron enameled sinks can be used with or without cabinets under and cabinets made of 20 gauge steel.

Ranges: When desired we can furnish ranges. Only fully insulated and fully enameled ranges with oven heat regulator are recommended.

Other Excel METALCRAFT Equipment: Steel laboratory furniture, medicine and bathroom cabinets, metal frame mirrors. **Write for literature.**

ST. CHARLES MANUFACTURING CO.

St. Charles, Illinois

Steel Kitchen Cabinets for Homemaking Laboratories

"Setting standards for the home" . . . and "demonstrating the possibilities of new or improved equipment for the home" are important duties of the school according to a bulletin issued by the U. S. Department of Interior. The school must lead the way.

This necessity points to the desirability of steel cabinets in the foods laboratory and other homemaking equipment. St. Charles Steel Kitchen Cabinets meet every requirement of durability, ability to withstand hard usage, sanitary qualities and economical and efficient arrangement.

In every school there are factors of shape, size, location of rooms and size of student body which must be considered in planning the Homemaking Department. The basic elements, however, are much the same. The problem of planning is to adapt these to the exact need of the institution. The pictures on these pages show some of the recent homemaking layouts we have planned and installed. These include both the laboratory type and unit kitchen type.

Foods Laboratory at Crystal Lake Junior High School
Crystal Lake, Illinois

Two sinks of stainless steel, back to back, in the center of each unit, with regular sink enclosure beneath. Flanked by work tables—also of stainless steel—with drawer cabinets below. Electric range and gas range at either end. With three such units, the room will accommodate twenty-four pupils. At one end is a complete model kitchen.

In this arrangement the sink is at one end of the table and the range at the other. Sink and work top are of stainless steel. Each unit accommodates four at one time, thus the room will serve a total of twenty-four pupils. Cupboard type base cabinets at either end of work table provide individual storage for each student. The model kitchen at the end of the room has a linoleum sink with maple tops on cabinets on the L side next to the range.

Highland Park High School
Highland Park, Illinois

OUR EXPERIENCE IS AT YOUR SERVICE

Whether your plan calls for unit kitchens or laboratory type of layout, or both, we can focus upon it experience gained in handling many similar undertakings. Given the opportunity to examine the plans for a new building or to survey and measure an existing building, we can design and prepare plans for the entire homemaking layout, including foods laboratory and clothing construction laboratory. In conjunction with the architect and instructor, we will work out the proper arrangement of sinks, ranges, work-tops; both as to location and type.

Work surfaces may be provided in stainless steel, linoleum, maple or other types as governed by the requirements of the work and the budget available.

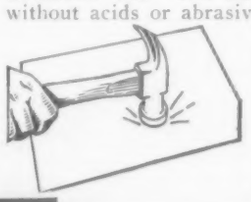
The plan may be worked out for immediate complete installation or part may be installed now—the plan providing for later addition.

Our School Planning Department will furnish these layouts, recommendations and estimates without charge or obligation. We welcome the opportunity to consult with and cooperate with school architects, engineers, superintendents, principals and home economics supervisors.

BUILT TO WITHSTAND THE STRESS OF CLASSROOM USE

Any equipment in school gets lots of hard use. St. Charles Kitchen Cabinets can "take it." Doors and drawers are sound deadened and close against rubber bumpers, efficiently quieting the effect of slams and pushes. Drawers operate on extra strong steel and terne-plate slides. Will support weights far greater than normally required. Cabinets are welded—will not pull apart. Hinges are strong and semi-concealed. They will readily stand the stress of opening and closing many times a day—often with a touch none too gentle.

Especially noteworthy is the finish on St. Charles cabinets. Its ability to stand up under the most severe tests—pounding, bending, hammering, heat, boiling water, alcohol—assure its durability and enduring beauty under strenuous use. The finish is easy to clean without acids or abrasives and will maintain its lustre despite repeated cleanings. The interior is smooth and flush, without projections—making it easy to keep sanitary inside and outside.



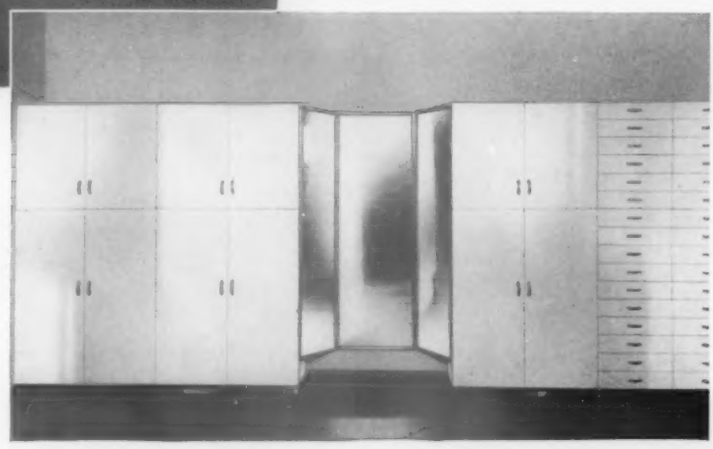
Lee Center High School
Lee Center, Illinois

This illustrates the practicability of the unit-kitchen type of layout. Each unit will accommodate four pupils. Sink tops are of stainless steel, adjacent work surfaces of maple. Sink front doors equipped with towel rods. Plenty of storage space in cabinets. The installation is planned so that it will be simple to extend it should additional work space or storage space be necessary. The lower picture shows the clothing laboratory in adjacent room, with modeling mirror—also tier of shallow drawers for storage of materials and equipment.

SENT ON REQUEST — PORTFOLIO OF PLANS DESIGNED FOR TYPICAL SCHOOL INSTALLATIONS

For architects, school officers, home economics instructors we have assembled a loose leaf portfolio of reproductions, about one quarter size, of plans prepared for a variety of school installations.

Each of these plans is different—individually designed for a specific purpose. The entire set is a store of information for anyone interested in a homemaking layout—whether for a new school or for one remodeled. For one of these portfolios—free—please write St. Charles Manufacturing Co., St. Charles, Illinois.



MUTSCHLER BROTHERS COMPANY

Nappanee, Indiana

SAMSON
Tables for the Classroom, Library, Office and Cafeteria.

PORTA-BILT
Portable Kitchen Furniture for Kitchens Of Every Type.

PORTA-BILT PLANNED KITCHENS
Indispensable for Progressive Education

Irrespective of the shape or size of your Domestic Science classrooms, whether your buildings are 50 years old or just in the blueprint stage, Porta-bilt standardized units will *exactly* meet your requirements for a "custom-built" modernized kitchen.

Porta-bilt units are separate, *portable* cabinets (as well as complete sink units) that fit side by side with a glove-like snugness. Built of hardwood, each unit reveals the proud work of craftsmen who for over 40 years have been manufacturing America's finest kitchen furniture.

Complete to the last detail, Porta-bilt cabinets are all ready to install the very day they arrive; no muss, no fuss, no time loss for installation.

Planning engineers are available to help you plan the maximum of efficiency at least cost. A request by post card will bring the information, specifications or service you require.

Porta-bilt installation in the Newton Public School, Pleasant Hill, Ohio, is one of many now used to demonstrate modernization in kitchen equipment.

SAMSON TABLES FOR EVERY PURPOSE

FIFTY SERIES illustrated (genuine American walnut or selected quarter white oak) is only one of a complete line for offices, directors' rooms, libraries, classrooms and cafeterias. Thousands now in use recommend that you write for catalog.

Top five-ply wood, finished underneath and securely supported with heavy cleats. Standard office dull-rubbed finishes. Shipped with ferrules unless otherwise specified.

Size	Drawers	Legs	Top
36 x 24″	One	Four 2¼″ solid	1½″
42 x 30″	One	Four 2¼″ solid	1½″
48 x 30″	One	Four 2¾″ box	1½″
54 x 30″	One	Four 2¾″ box	1½″
60 x 34″	Two	Four 3″ box	1½″
72 x 36″	Two	Four 3″ box	1½″
96 x 48″	Two	Four 3¾″ box	1½″
120 x 48″	Two	Five 3¾″ box	1¾″
144 x 48″	Two	Five 3¾″ box	1¾″
168 x 48″	Two	Six 3¾″ box	1¾″
192 x 48″	Two	Six 3¾″ box	1¾″

DOEHLER METAL FURNITURE CO., INC.

For Dormitory—Cafeteria—Reception Room—Infirmary

DORMITORY CAFETERIA RECEPTION ROOM
INFIRMARY CHROMIUM BEDDING

Executive Offices: 192 Lexington Avenue, New York

BRANCH OFFICES

Boston
99 Portland Street

Cleveland
2184 East 9th Street

Washington
209 Mills Building

DOEHLER METAL FURNITURE FOR SCHOOL & COLLEGE DORMITORIES

DOEHLER dormitory furniture and equipment is now being widely used throughout the country in many of the outstanding schools and universities. Our many years of experience in meeting the exacting demands for attractive, durable metal furniture is responsible for our enviable reputation in the dormitory equipment field.

The interior pictured above, illustrates only a small portion of our very extensive line of stock items particularly adaptable to school and dormitory use. Our line covers a complete range of varied designs in suites and separate pieces of both the traditional period design and the currently popular contemporary styles.

Doehler furniture is truly comfortable. All metallic sounds have been eliminated, drawers always slide easily, it never loosens, cracks or chips. All products are available in both natural wood grain reproductions and in pleasing, cheerful colors of Dohlite which is resistant to cigarette burns, hard knocks, steam heat, climatic conditions, and which always retains its original atractiveness.

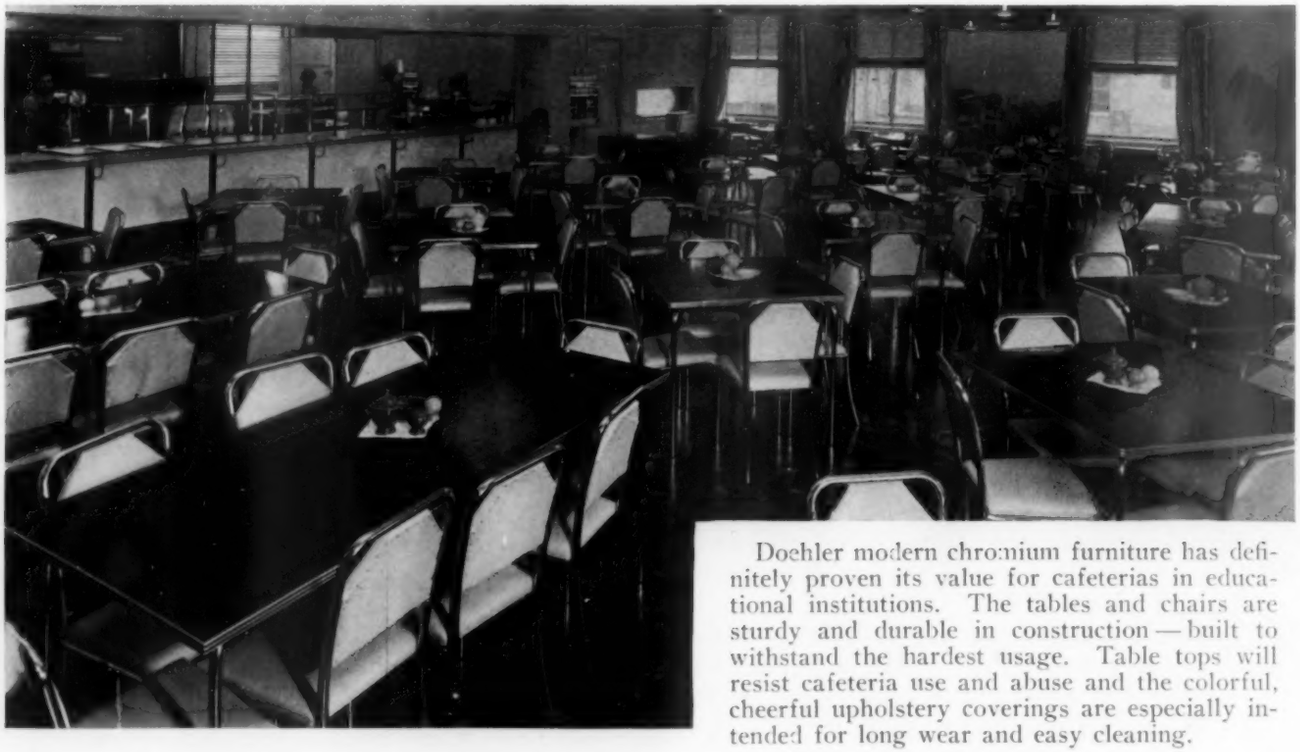
WRITE FOR ILLUSTRATED CATALOGS AND COMPLETE DETAILS

DOEHLER CHROMIUM FURNITURE

For Auditoriums and Cafeterias

This installation adequately illustrates the highly attractive results that may be obtained with Doehler modern chromium furniture. Used in auditoriums, lecture rooms and other mass meeting places, Doehler chromium furniture emphasizes comfort, smart styling, and excellent taste, yet is remarkably moderate in cost.

BEAUTY PLUS DURABILITY WITH DOEHLER CHROME



Doehler modern chromium furniture has definitely proven its value for cafeterias in educational institutions. The tables and chairs are sturdy and durable in construction — built to withstand the hardest usage. Table tops will resist cafeteria use and abuse and the colorful, cheerful upholstery coverings are especially intended for long wear and easy cleaning.

WE ARE QUALIFIED TO PREPARE BUDGETARY ESTIMATES FROM YOUR FLOOR PLANS

THE AMERICAN SCHOOL AND UNIVERSITY

DOEHLER CHROMIUM FURNITURE

For Reception Rooms, Lobbies and Offices

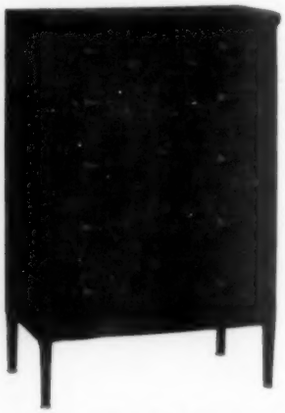
The smart styling, distinctiveness of appearance, sturdiness and durability of construction found in Doehler modern chromium furniture is particularly adaptable for college Reception Room, Lobby and Office use. True comfort — at low cost is a primary requisite of Doehler chromium furniture.

CREATING THE RIGHT IMPRESSION WITH DOEHLER CHROME

Doehler modern furniture offers many outstanding advantages for use in college Reception Rooms, Lounges, Lobbies and other public rooms. It is smartly styled in excellent taste and will harmonize with any decorative scheme.

WRITE FOR COMPLETE DETAILS AND ILLUSTRATIVE LITERATURE

THE AMERICAN SCHOOL AND UNIVERSITY

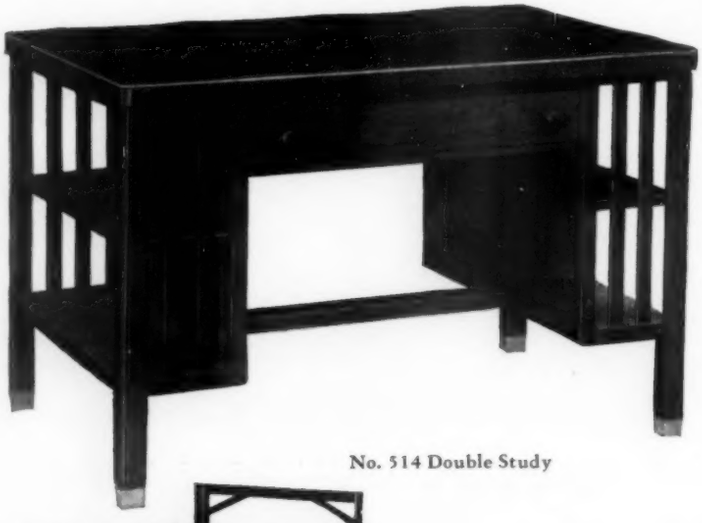


No. 321-2 Chiffonier

We illustrate a few miscellaneous Doehler items which have proven particularly adaptable to dormitory use. Their ever-increasing popularity is due primarily to distinctive designing, lasting construction and moderate pricing suitable to all budgets.

No. 54 Easy Chair

No. 261 Side Chair



No. 514 Double Study

No. 321-7 Desk

No. 4511 Double Decker

No. 9117G Dormitory Bed

WE SPECIALIZE IN COLLEGE INFIRMARY "APPROVED" FURNITURE

Miscellaneous: Hospital Beds, Bedside Tables, Overbed Tables and Specialized Equipment for Hospital Use.

DOEHLER MATTRESSES

Our line includes a wide range of mattresses of every type and construction. Let us know your requirements and we will recommend the type of Doehler Mattresses.

INQUIRE ABOUT OUR COMPLETE LINE OF SPRINGS, STUDIO COUCHES, DIVANS, COTS, ETC.

L. & J. G. STICKLEY, INC.

Furniture for Class Rooms, Dining Halls, Dormitories
Home-making Rooms, Student Quarters, and Offices

Fayetteville, N. Y.

COSTS LESS PER YEAR

Stickley furniture "costs less per year"—because the maintenance and replacement costs are consistently lower. Stickley furniture is built to the highest quality standard in every detail. The material used is the finest—solid maple of selected pieces, all kiln-dried and held to a pre-determined moisture content, affording maximum protection against checking. Construction methods are the finest—following faithfully the guild craftsmanship of Stickley home furniture. It is proof against looseness, warping, binding.

The special processing used in obtaining the well-known Stickley finish actually impregnates the wood with color. It gives a deep, beautifully rich finish—one usually associated with aged cabinet woods. It will not scratch white . . . will not wear light on exposed edges. The usual polishing care preserves its soft sheen indefinitely, saving the expense of frequent and costly re-finishing.

Home-making Room

ture every mortise and tenon joint is glued in a tight wood-to-wood contact, then is permanently locked by a wooden peg driven through the two connected members.

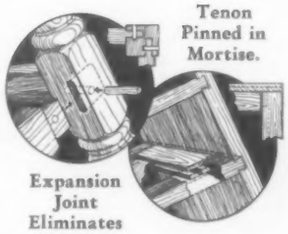
An exclusive and patented Stickley feature lengthens the life and preserves the beauty of all Stickley desks, cabinets and cases. Illustrated below, it shows how the connecting member between the front and back division rails of a panel is rigidly fastened **only at one end.** The supporting edge is fitted into a dovetail in the panel, through which it can slide under pressure. The other end is held by a snugly-fitting tongue and groove joint. And while the entire assembly is thus free from looseness, yet it does permit sufficient movement to allow for any expansion or contraction in the wood panel. Hence all warping and checking are avoided.

Cafeteria

Students' Room

PERMANENTLY TIGHT JOINTING

All Stickley furniture is joined by the most durable and costly methods known to cabinet-making. The dovetailing—which locks itself into a permanently tight joint—is strongly glued for further rigidity and permanence. The mortise and tenon joints—uniting two members by inter-fitting parts of the members—are vastly superior to doweled, or three-piece, joints. Moreover, in Stickley furni-



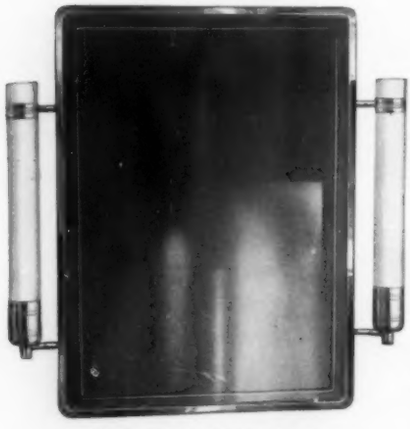
FURNITURE WITH A REAL CULTURAL VALUE

Stickley school and college furniture reflects the quality-tradition and cultural value of Stickley Colonial furniture for the home — furniture of true artistic charm. It is furniture that will command the respect of the entire community.

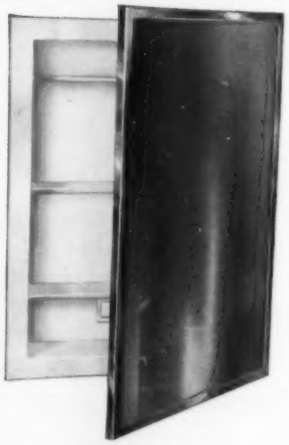
Write for new catalog showing complete line of Stickley furniture for schools, colleges, and fraternity houses. Please state the name of your dealer.

THE MIAMI CABINET DIVISION
The PHILIP CAREY COMPANY
Middletown, Ohio

Dormitory Special



Nos. 1100, 1150, 1175



Nos. 2030, 2040, 2050

THE list of Miami Cabinet installations include: Notre Dame, Columbia, Yale, Texas, Duke, John Carroll and many other colleges and universities.

MIAMI Cabinets are distinctive in design, beautiful in appearance, strongly built of highest quality materials and finished to give lifetime service under hard usage.

The MIAMI Line includes models to meet every requirement. A few cabinets especially adapted for schools and other public and private institutions are illustrated and described on these pages. Your architect or contractor can supply additional details. Catalog mailed upon request.

DORMITORY SPECIAL

Regular Equipment: Overhead towel tray with douche bag hooks, two bronze, chromium-plated light brackets, light switch, convenience plug for electrical accessories, combination face towel and razor strop hook, razor blade drop, three adjustable glass shelves and one white Vitrolite shelf. Cabinets are completely wired at factory.

SPECIFICATIONS

	Overall	Mirror	Wall Opening
Dormitory Special	16¾″ x 26¾″	12″ x 16″	13½″ x 24½″ x 3⅞″

MASTER MODEL WITH TUBULAR LIGHTS

Chrome framed; no knob, hardware or portion of the body is visible. Frames are one-piece solid brass, chrome applied over nickel. Cabinet body and door back finish is Miami Crystal Snow. Heavy chromium-plated piano-type hinges, copper-backed mirror, three plate glass shelves, drop for used razor blades, tooth brush racks.

Metal parts of light brackets are brass, finished in deep, lustrous chromium. Glass shade is opal, designed to take a T-8 bulb, 40 watt. Bulb is available at all stores that sell light bulbs. Cabinet is complete with light switch and convenience plug.

SPECIFICATIONS

	Overall	Mirror	Wall Opening	Return Flange
No. 1100...	16¼″ x 22¼″	16″ x 22″	13¾″ x 19¾″ x 4¼″	¼″
No. 1150...	18¼″ x 24¼″	18″ x 24″	15¾″ x 21¾″ x 4¼″	¼″
No. 1175...	20¼″ x 28¼″	20″ x 28″	17¾″ x 25¾″ x 4¼″	¼″

SQUARE TOP MODELS

This square top model, with mirror set in stainless steel frame, is recommended for the bathroom where the design is straight lined rather than arched or curved.

Fitted with selected No. 1 plate glass mirror, copper protected, guaranteed for five years against silver spoilage. Cabinet doors are the heavy air-cushion type hung on heavy piano hinges. The cabinet bodies and door backs are finished in three coats of first-quality baked enamel applied over rust-resisting under-coat. Cabinet is fitted with three glass shelves and tooth brush racks.

SPECIFICATIONS

	Overall	Mirror	Wall Opening
2030	16⅝″ x 22⅝″	16″ x 22″	13¾″ x 19¾″ x 3½″
2040	18⅝″ x 24⅝″	18″ x 24″	15¾″ x 21¾″ x 3½″
2050	20⅝″ x 28⅝″	20″ x 28″	17¾″ x 25¾″ x 3½″

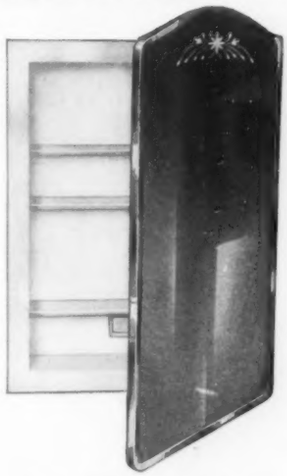
MIAMI BATHROOM CABINETS AND ACCESSORIES...

FRAMED VENETIAN MODELS

Mirror on Model 1622-BF is set in rich black enamel frame. Mirror on Model 1622-CF is set in a brass, chromium-plated frame. Mirror frames are of one-piece construction, no open joints at corners. Mirrors are selected No. 1 plate glass, copper protected. Three adjustable, bulb-edge glass shelves, chromium-plated razor blade drop, two tooth brush holders, cabinets finished in three coats of first-quality baked enamel applied over rust-resisting under-coat.

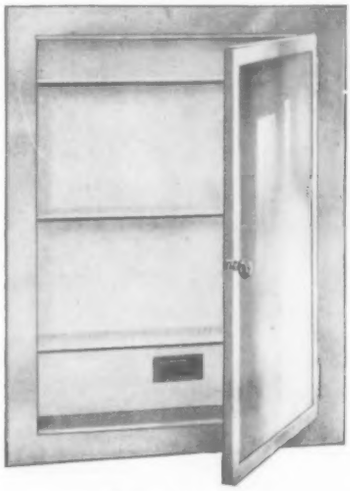
SPECIFICATIONS

	Mirror	Inside	Wall Opening	Overall
1622-BF	16″ x 24″		13¾″ x 19¾″ x 3½″	
1622-CF	16″ x 24″		13¾″ x 19¾″ x 3½″	
200	12″ x 16″	13″ x 17″	13½″ x 17½″	16¾″ x 20¾″
220	14″ x 18″	15″ x 19″	15½″ x 19½″	18¾″ x 22¾″
210	12″ x 16″	13″ x 23″	13½″ x 23½″	16¾″ x 26¾″
230	14″ x 18″	15″ x 25″	15½″ x 25½″	18¾″ x 28¾″
240	16″ x 16″	17″ x 23″	17½″ x 23½″	20¾″ x 26¾″



Nos. 1622-BF, 1622-CF

FLUSH DOOR RECESSED MODEL CABINETS



Nos. 200, 220

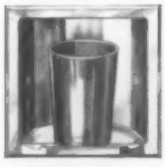
These models are especially recommended for the modest bathroom where price is to be considered. They are practical in design, rugged in construction, and of a uniformly high quality.

Made from heavy gauge ARMCO autobody steel. Adjustable glass shelves, copper protected mirrors, nickel-plated hinges, razor blade drop, tooth brush racks. Finished in high-grade baked enamel. Bevel or plain mirrors may be had in any of these cabinets. Specify type of mirror when ordering. For specifications see above.

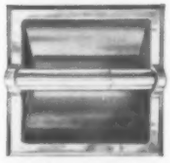
Nos. 210, 230, 240

MIAMI CHROMIUM BATHROOM ACCESSORIES

Retain their beauty and brilliance through years of wear and hard use. They are made of forged brass, heavily nickeled, then covered with hard chromium. This method of manufacture assures a product that will give utmost satisfaction and retain its original brilliance. There is a Miami Accessory for every modern bathroom requirement; recessed and projection types. Easy to install—inexpensive.

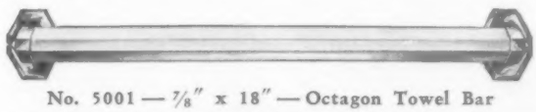


No. 6001
Tumbler Holder

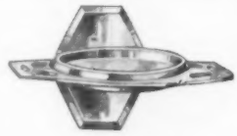


Paper Holder
No. 6002 —
Chrome Roller
No. 6003 —
Wood Roller

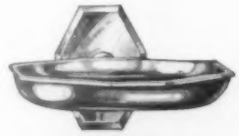
No. 5014 — ⅜″ x 5″ x 18″ Glass Shelf — Chrome Brackets



No. 5001 — ⅞″ x 18″ — Octagon Towel Bar



No. 5008
Tumbler and Toothbrush Holder



No. 5005—Soap Dish
No. 5006—Soap Dish
with Drain Holes

THE BASSICK COMPANY

Bridgeport, Conn.

Bassick

RUBBER CUSHION FURNITURE SLIDES

Designed to allow easy movement of chairs, tables and other furniture with the elimination of all chatter and vibration and noise.

No. CG-90
⅞" Diam. Base

No. CG-91
1 1/16" Diam. Base

No. CG-92
1¼" Diam. Base

No. CG-93
1½" Diam. Base

Bassick Rubber Cushion Slides are a real necessity in class rooms and offices, etc., wherever chairs are used on hard surface floors and where the elimination of noise is desirable.

The sharp steel nail drives easily with a hammer.

The special design of the live rubber cushion with annular rings gives added resiliency and insures quietness in use.

A case hardened heavy gauge steel base with flat bearing surface provides excellent wearing and easy sliding quality.

Standard finish nickel plated. Can be furnished in oxidized copper or special finishes where required. For the most satisfactory service always use the largest size which the bottom of the leg will accommodate.

WITH MACHINE SCREW ATTACHMENT

Any of the above sizes can be furnished with 8/32 threaded machine screws with ⅜" length of projection above the rubber cushion.

New Nos. with Machine Screws	CG-290	CG-291	CG-292	CG-293
Diam. of Base	⅞"	1 1/16"	1¼"	1½"

WITH GRIPNECK PINTLES

The following two sizes of Bassick Rubber Cushion Slides are available with pintles to fit standard ⅜" gripneck sockets for wood furniture.

Where chairs and other furniture are equipped with caster sockets these quiet, easy moving slides provide an easy and practical installation.

Nickel plated or oxidized copper finishes standard. Always specify finish desired.

Nos.	Diam. of Base	Bore for Socket	Wt. per Set—Oz.
CG-392	1¼"	⅜"	7
CG-393	1½"	⅜"	9

BUCKEYE GLIDE COMPANY, INC.

DEPT. AS-39

131 East 23rd Street, New York City, N. Y.

'HEAVY DUTY' NOISELESS FURNITURE GLIDES

Quiet Moving on All Floors, Including Stone

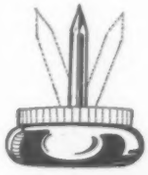
FOR EVERY TYPE CHAIR — DESK — TABLE — WOOD OR METAL

Cut showing the Vibration Absorbing construction of the Spring - Kushion Noiseless Glides.

CHAIR SIZE

For chairs, and light tables, and for other light weight furniture.

To attach simply hammer on tight.



No. 136 Type N 7/8" dia. Nail on Glide

No. 206 Type N 1¼" dia. Nail on Glide

HEAVY FURNITURE SIZE

For heavier furniture such as settees, Morris and other heavy chairs, desks, benches, large tables, couches, etc.

FOR METAL FURNITURE

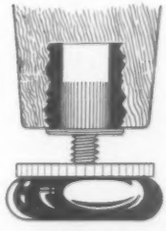
Type B

Type B: Fitted with threaded shank for use on metal furniture. Nuts and lock washers supplied.

Type DS: Fitted with hardened thread cutting shank. Plain hole in the metal and these glides drive in. No threading necessary. Hold on metal 1/8" or thicker.

Both types made in two sizes:

No. 136 size 7/8" dia.
No. 206 size 1¼" dia.



No. 206 Type A 1¼" dia. Anti-wobble Glide. Adjustable in height

WILL STOP ALL WOBBLE WILL LEVEL FURNITURE

This glide will take the wobble out of any Dining Room Table or Desk. A turn of the glider head is all that is necessary to steady the table.

FOR • SILENT • MOVING • SCHOOL • CHAIRS

These "Spring-Kushion" Glides can be used on any type of floor.

Terrazzo, Composition, Wood, Tile, Linoleum, Rugs, Carpets, Concrete and STONE.

They take up all vibrations within themselves, and impart an ease of motion to furniture that is entirely new.

This easy motion takes strain from chair frames and seats and makes for longer chair life.

The glides are all solidly built for heavy duty school work, of hardened steel, are polished and nickeled. The shells are harder than a steel file. Within is the tempered steel spring which assures perfect contact of the shell to the floor at all times.

A pure rubber cushion and the attaching pin complete the assembly.

The shells of all "Spring-Kushions" are flat, to insure greatest bearing surface and to avoid denting of linoleums, etc.

SAMPLES ON REQUEST

FAULTLESS CASTER CORPORATION

DEPT. SU-38

Evansville, Indiana

REPRESENTATIVES IN PRINCIPAL CITIES — CANADIAN FACTORY: STRATFORD, ONTARIO

DOUBLE BALL BEARING CHAIR CASTERS

In the office, the library, the study rooms, Quiet is a golden virtue. Faultless Casters are designed for quiet, smooth operation. Faultless Casters swivel quickly and with minimum effort. For the user, they make possible greater efficiency and contentment. Sturdy construction assures years of economical service. The special double ball bearing swivel caster featured here is finished in oxidized copper to harmonize with any furniture.

Notice the double row of polished and specially hardened ball bearings which assures quick swiveling, effortless movement and absolute quiet. The wide shoulder with center of gravity offset at such great distance from the wheel is another Faultless feature that makes for positive swiveling. Dust proof construction.

Packed in 1 Set Individual Display Carton with Sockets, Copper Oxidized Finish

RUBEREX (Cushion Tread) WHEELS

Style Number	Wheel Dia.	Wheel Bearing	Height, Floor to Track Plate
2478	1⅝	Plain	2¼
2479	2	Plain	2½
BG2257-8	1⅝	Ball	2⅛

ROCKITE (Hard Tread) WHEELS

Style Number	Wheel Dia.	Wheel Bearing	Height, Floor to Track Plate
2778	1⅝	Plain	2⅛
2779	2	Plain	2½
BG2857-8	1⅝	Ball	2⅛

FAULTLESS CUSHION CHAIR GLIDES

Faultless Cushion Chair Glides give double protection. The live rubber insulation protects against jars and vibration; the smooth rounded edges of the glide protect floors from being marred.

Faultless Cushion Chair Glides are offered in four sizes. They are sturdily built of formed hardened steel and will outwear the chairs on which they are used. They are finished in oxidized copper to harmonize with any style of furniture.

Packed in 1 Set Individual Display Carton, Copper Oxidized Finish

FLEXIBLE CUSHION CHAIR GLIDES

Number	Diameter Base
NRS	⅞"
NRS	1 1/16"
NRS	1¼"
NRS	1½"

CUSHION CHAIR GLIDES WITH MACHINE SCREW ATTACHMENT

Number	Diameter Base
SRS	⅞"
SRS	1 1/16"
SRS	1¼"
SRS	1½"
SRS with nut	⅞"
SRS with nut	1 1/16"
SRS with nut	1¼"
SRS with nut	1½"

CUSHION CHAIR GLIDES WITH SPRING CLIP SOCKET FOR METAL TUBING

Number	Diameter Base	Approx. O.D.
	For Round Tubing	
ORS	⅞"	⅞"
ORS	1 1/16"	⅞"
ORS	1 1/16"	1 "
ORS	1¼"	1 "
ORS	1½"	1 "
	For Square Tubing	
ORS	1 1/16"	1 "
ORS	1¼"	1 "

When ordering ORS Glides specify outside diameter of tubing and whether socket is wanted for round or square tubing.

FAULTLESS FURNITURE CUPS

Packed in 1 Set Individual Display Carton

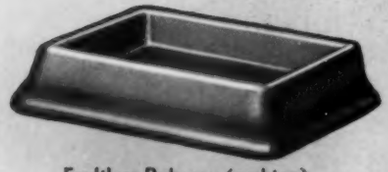
SQUARE ROCKITE OR RUBEREX FURNITURE CUPS

Number	Size of Opening	Weight Per Set
SDC 1½	1½"	6 Oz.
SDC 1¾	1¾"	7 Oz.
SDC 2	2"	13 Oz.
SDC 2⅝	2⅝"	15 Oz.

ROUND ROCKITE OR RUBEREX FURNITURE CUPS

Number	Diam. of Opening	Weight Per Set
RDC 1⅜	1⅜"	5 Oz.
RDC 1⅝	1⅝"	7 Oz.

Be sure to specify whether Rockite (hard) or Ruberex (Cushion) is wanted when ordering.



Faultless Ruberex (cushion) or Rockite (hard) Furniture Cups, for stationary heavy furniture are made of non-breakable, rustproof composition, in a harmonizing brown shade that will not lose color.

Unless otherwise specified, Rockite Furniture Cups will be supplied.

Faultless Cushion Chair Glide with machine screw attachment. 8-32 thread. For use on metal chairs.

Faultless quiet Cushion Chair Glides are mounted in live rubber. Steel reinforcing frame prevents nail pulling out. Base is of hardened steel, copper oxidized, impervious to wear.

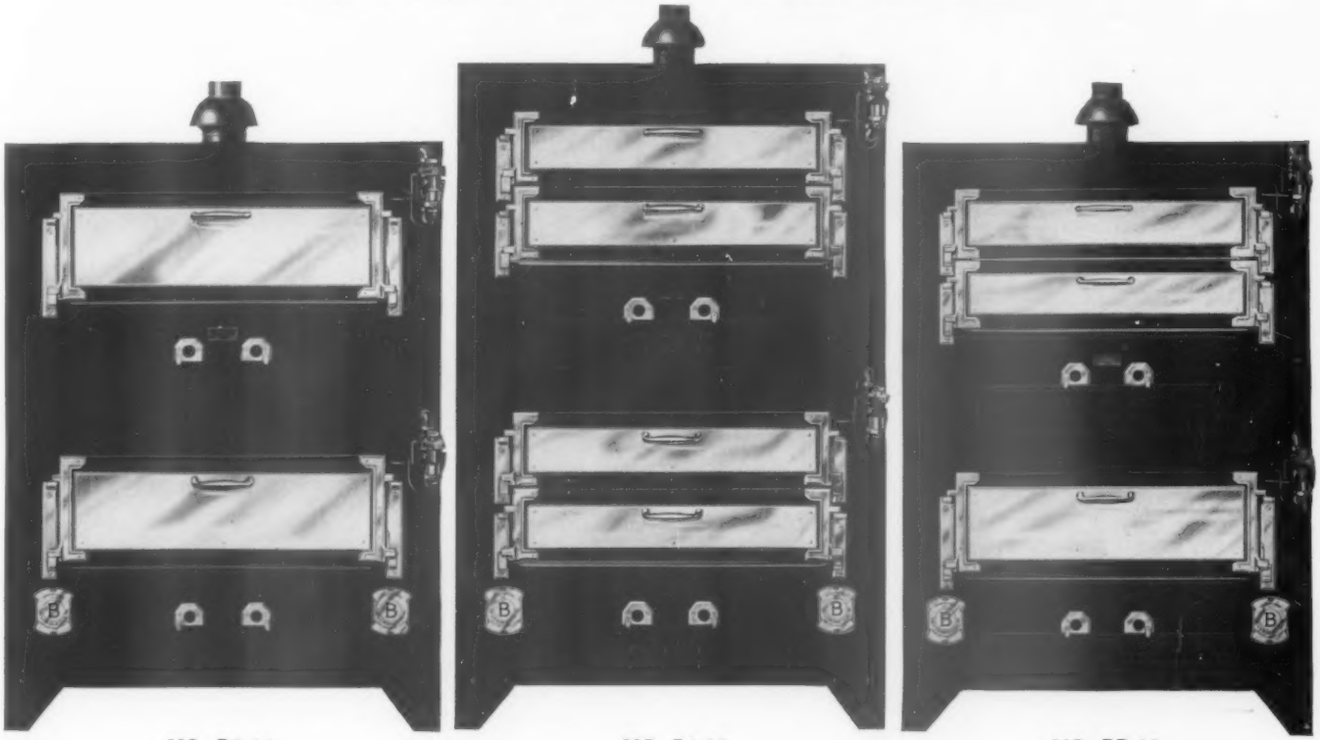
ORS Cushion Chair Glide with Spring Clip Socket for square or round metal tubing.

Since 1848 **THE G. S. BLODGETT CO., INC.** Since 1848

Burlington, Vermont

BLODGETT'S NEW GAS OVENS

Especially Suitable for School Kitchens



NO. R2-15 NO. B4-15 NO. RB-15

The ROASTER-BAKER Models have two separate compartments in one oven, each compartment with separate gas burners and automatic temperature control

These ovens are built in three types as shown. Each type is built in two sizes. Each compartment may be used equally well for baking or roasting with large or small, high or low pans or pots. The ovens with high compartments are particularly adapted for bean pots, tall dishes, and large or small roasts.

Economy in operation and flexibility in use are the important features of the ROASTER-BAKER Models. Baking or roasting at different temperatures can be done at the same time. This saves the time of the operator who can be using two different oven temperatures, and so be baking or roasting two entirely different products at one time. If there are two bakers, or one baker and one meat cook, each has his own individual oven and each can operate it according to his own needs. Temperatures may be changed quickly to meet a variety of work. Moreover, there are days, and certain hours during a day, when baking or roasting requirements are light, consequently only one compartment of a ROASTER-BAKER Oven need be used and so one-half the gas is saved.

The distribution of heat can be controlled more evenly because the baking compartments are smaller in area. The result of this inherent advantage of the ROASTER-BAKER Model is better, more uniform, and time-saving baking and roasting.

Today the usual kitchen planning calls for a battery of ranges primarily installed to furnish top cooking area for short order work. But these ranges are always furnished with ovens for roasting underneath this top cooking area. Such ovens are inconvenient to work on, necessitating bending and stooping to load and unload heavy roasts.

A Blodgett ROASTER-BAKER Oven located in a small floor space away from the area in front of the ranges, relieves congestion and confusion, saves time and tempers, and guarantees improved service at minimum operating costs.

CONTROL YOUR COOKING OPERATIONS

Save with *GAS*—the Better Fuel

REPUBLIC STEEL CORPORATION

Alloy Steel Division: Massillon, Ohio General Offices: Cleveland, Ohio

BERGER MANUFACTURING DIVISION
STEEL AND TUBES, INC.—TRUSCON STEEL COMPANY

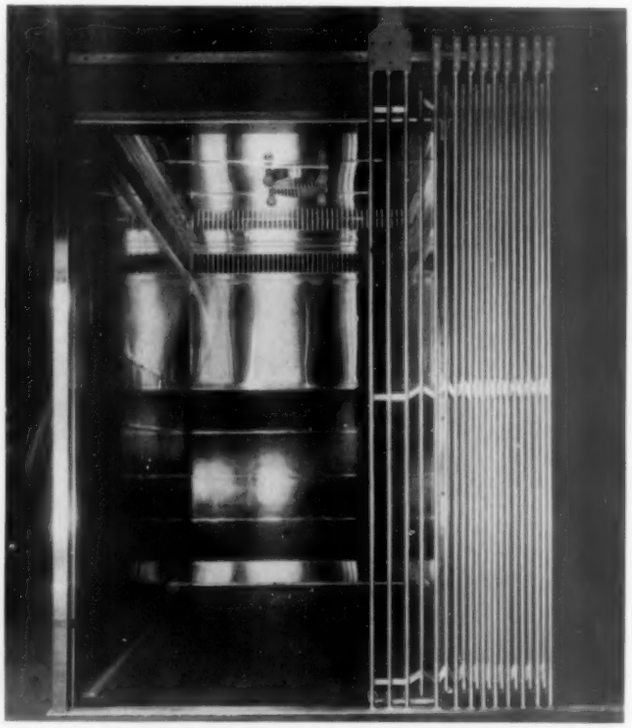
ENDURO

REPUBLIC'S PERFECTED STAINLESS STEEL

ENDURO Stainless Steel—the universally satisfactory metal—offers many advantages to schools. Its beauty, high strength, corrosion-resistance, sanitation, cleanliness, immunity to food products, ease of fabrication, long life and economy make it the ideal material for all types of installation. It is being widely used for kitchen and cafeteria equipment, utensils, laboratory equipment, toilet partitions, railings, kick plates, hardware, hoods, elevators, ducts, cabinets, shelving, lighting fixtures, grilles, spandrels and other ornamental and utilitarian applications.

ENDURO is completely sanitary. It is non-porous—easy to keep clean. Washing with soap and water, or occasional wiping with a damp cloth and a gentle cleansing powder, restores its original gleaming lustre. Harsh cleansers and polishes are unnecessary. It is immune to the action of meat, fruit, vegetable and dairy product juices and acids. It has no effect on foods—does not contaminate nor affect flavor, odor, color or composition. It is highly resistant to most acids, alkalies and fumes.

ENDURO is just as clean and sanitary as it looks. It retains its lustrous beauty for life—keeps cafeteria equipment new looking for many years



The beauty and high strength of ENDURO suggests its use for all types of architectural and structural use. This gleaming elevator cabinet demonstrates one of its many applications

Far stronger than ordinary steel, ENDURO resists hard service and abuse—does not dent easily. It resists heat. Hot utensils will not mar its surface. ENDURO utensils hold heat longer—help to keep foods warm longer.

As a decorative medium, ENDURO adds beauty to any design. Its silvery-white lustre harmonizes with any color scheme—with any other material. Finish may range from a soft satin to a high mirror polish. It is highly resistant to rust and corrosion—is unaffected by weather. It resists tarnishing and staining.

Because it is solid stainless steel throughout, ENDURO lasts indefinitely—retains its newness for years and years. Its long life and ease of maintenance make it highly desirable from the standpoint of economy. Records in schools and other institutions prove its low cost.

ENDURO is capable of fabrication into many kinds of equipment. Many well-known manufacturers standardize on ENDURO for their products. Others are glad to use it when specified. Write us for complete information and names of fabricators.

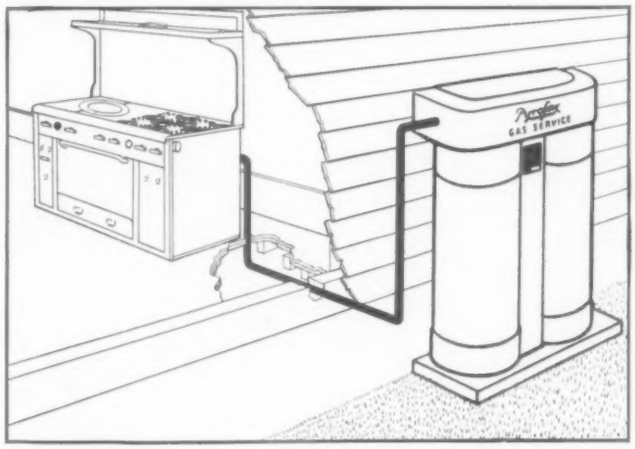
"PYROFAX" GAS DIVISION

CARBIDE AND CARBON CHEMICALS CORPORATION

30 EAST 42nd STREET, NEW YORK, N. Y.

"PYROFAX" GAS FOR MODERN COOKING IN SCHOOLS BEYOND THE MAINS

"Pyrofax" gas is real gas, not a liquid fuel, and burns just like city gas. With it institutions of all kinds can have the convenience and economy of city gas service even though they're located beyond the gas mains.



AUTOMATIC! Two cylinders (guaranteed to contain 100 lbs. of "Pyrofax" gas each) are delivered to your school—one for use—one for reserve. Automatic changeover device, available for slight additional charge, turns on supply from reserve cylinder as soon as cylinder in use becomes empty.

Simple, reliable equipment. The equipment is simple, reliable and automatic. As the illustration shows, the "Pyrofax" gas regulating equipment, which is placed out of doors, accommodates two cylinders of gas and a pressure reducing assembly. Gas flows from the cylinder in use to the regulator where pressure is reduced to six ounces, then through seamless copper tubing to the kitchen. The "Pyrofax" gas two-cylinder system (one cylinder in use, one in reserve) assures uninterrupted service. Each cylinder of "Pyrofax" gas when used with properly adapted ranges produces usable heat equivalent to approximately 5700 cubic feet of manufactured gas.

Supply guaranteed. Future supply of "Pyrofax" gas is guaranteed by Carbide and Carbon Chemicals Corporation, a unit of Union Carbide and Carbon Corporation. Prompt gas delivery is assured anytime, anywhere and in any weather.

Widely used. "Pyrofax" Gas Service is used by hundreds of schools and universities in kitchens, laboratories and infirmaries. It is clean, fast, inexpensive, reliable. "Pyrofax" gas provides *all* the advantages of city gas.

Read This Statement From An Enthusiastic "Pyrofax" Gas User

"We considered for the Proctor Academy kitchen all standard types of cooking equipment. We found that those disadvantages presented by other fuels are absent in the case of gas which has four advantages—quick heat, absolute cleanliness, economy in price and use, and attractive equipment.

"We finally awarded our contract for complete cooking equipment to 'Pyrofax' Gas. Your representative in this district supports an excellent product with the most courteous and efficient service possible. We commend 'Pyrofax' for having so able a representative in this territory. We only regret that we did not purchase your equipment years ago."

Magic Chef Heavy-Duty Cooking Equipment for Use with "Pyrofax" Gas. Magic Chef cooking equipment can be supplied to perform every large scale cooking operation. Complete stove units ranging from one-burner hot plates to large capacity battery equipment as well as short order stoves, griddles, deep fat fryers, coffee urns and steam tables are available for use with "Pyrofax" gas.

This Heavy Duty Cooking Range is typical of Magic Chef equipment for use with "Pyrofax" gas. It is 48" wide, 34" deep, 32" high. It has half solid and half grate top. Solid top has ring and center burner. Grate top has 4 Giant Magic Chef Burners.

Features. Many new features make Magic Chef one of the most complete and serviceable of all commercial cooking equipment:

- Non-clog giant burners
- Non-sagging block insulation
- Uniform heat top
- High-speed burners
- Cool tubular oven handles
- Extra heavy cooking top
- Convection ovens
- Lorain Red Wheel oven heat regulator
- Removable burner trays
- Porcelain-enamel oven lining

Your nearby "Pyrofax" Gas Distributor has been chosen for his ability to render reliable and efficient service at all times. For his name and address write to "Pyrofax" Gas Division, Carbide and Carbon Chemicals Corporation, 30 East 42nd St., New York, N. Y.

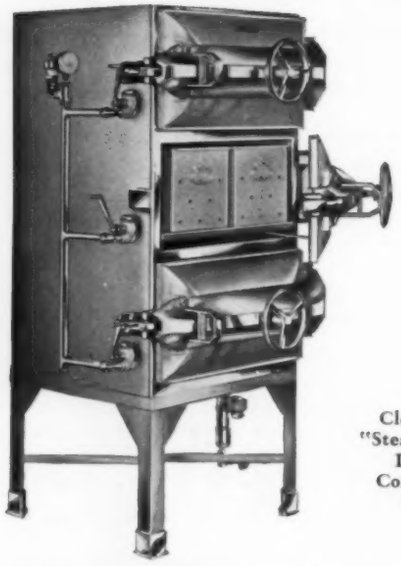
"Pyrofax" is a registered trade-mark of Carbide and Carbon Chemicals Corporation

THE CLEVELAND RANGE CO.

Cleveland, Ohio

STEAM-CHEF STEAM COOKERS

for all School, College and Institution Kitchens
Direct Steam — Gas — Electric Operation



Cleveland "Steam-Chef" Direct Connected Unit

STEAM COOKING is the modern method for better retaining natural food elements and nutrition values. Every Steam-Chef Cooker is a saver of time, space and labor, permitting **continuous** cooking, which provides a steady flow of freshly cooked food without loss from over-supply or long steam table storage. Steam-Chef Models are furnished for operation by direct steam, or by gas or electricity. Any Steam-Chef is a big fuel economizer, is always ready for action, and can be used for many foods now prepared in other ways.

Send for interesting booklet "Getting the Most from Steam Cooking."

SIZES AND TYPES—Over 50 models, sizes and types . . . units to fit practically any requirement.

BODY CONSTRUCTION—One piece welded bodies of heavy plate steel . . . rust-proofed or stainless; easy to keep clean and sanitary.

"FULL FLOATING" DOORS—Always seat perfectly; never require adjustments; long gasket life.

SAFE OPERATION—Positive safety provided by doors which cannot be opened while steam is being admitted to compartments.

THERMOSTATIC EXHAUST SYSTEM—Eliminates steam vent line and reduces steam consumption 50% to 80%.

FULL AUTOMATIC CONTROL—Automatic fuel control, in addition to automatic control of boiler water level, on gas and electric units, effects fuel saving of 33⅓%. This is an exclusive feature.

Complete information and detailed specifications will be furnished on request. Sold through recognized kitchen equipment dealers everywhere.

Full automatic gas operated "Steam-Chef." Gas and water automatically controlled

PROMINENT SCHOOL INSTALLATIONS

Redford High School, Detroit, Michigan
Arsenal High School, Indianapolis, Indiana
John P. McCaskey High School, Lancaster, Pennsylvania
North Senior High School, Binghamton, New York
Forest Park High School, Springfield, Massachusetts
Andrew Jackson High School, Springfield, L. I., N. Y.
Hopkins Grammar School, New Haven, Connecticut
Chicago Board of Education, Various locations
Rock Island High School, Rock Island, Illinois
Bayonne High School, Bayonne, New Jersey
Northwestern Jr. High School, Reading, Pennsylvania
Utica High School, Utica, New York
Peddie School, Hightstown, New Jersey
Norwalk High School, Norwalk, Connecticut
Brooks School, North Andover, Mass.
Kensington High School, Buffalo, New York
Bellingham High School, Bellingham, Washington
Central High School, Columbus, Ohio
Peoria High School, Peoria, Illinois
Fishburne Military Academy, Waynesboro, Virginia
Skidmore College, Saratoga Springs, New York
Michigan State College, East Lansing, Michigan
Purdue University, LaFayette, Indiana
Duke University, Durham, North Carolina
Clemson College, Calhoun, South Carolina
University of Nebraska, Lincoln, Nebraska
Queens College, New York City
University of Maryland, College Park, Maryland
Colgate University, Hamilton, New York
Saint Ignatius College, Manhasset, L. I., N. Y.
Beaver College, Jenkintown, Pennsylvania
University of Michigan, Ann Arbor, Michigan
Saint Joseph's College, Collegeville, Indiana
University of Virginia, Charlottesville, Virginia
Swarthmore College, Swarthmore, Pennsylvania
Western State College, Gunnison, Colorado
Dartmouth University, Hanover, New Hampshire
Brooklyn College, Brooklyn, New York
Saint Procopius College, Lisle, Illinois
Syracuse University, Syracuse, New York.

EDISON GENERAL ELECTRIC APPLIANCE COMPANY, INC.

5600 West Taylor Street, Chicago, Illinois

MANUFACTURERS OF

COMMERCIAL EDISON Hotpoint EQUIPMENT

Announce A NEW ECONOMY FOURSOME
FOR SCHOOLS, HOSPITALS AND INSTITUTIONS

THE "BRAWNY LAD"

NEW LOW PRICED COMMERCIAL RANGE

A low priced range of commercial construction and wide adaptability, the "Brawny Lad" is designed to fit installations where the heavy construction, large capacity, and higher cost of standard commercial ranges are not justified, yet where long hours use and institutional conditions render domestic type ranges unsuitable. In this classification fall the diet kitchen, the small hospital, the smaller school lunch room, and the community house where food is prepared to serve from ten to fifty persons per meal.

"Brawny Lad" has a large, fast automatic oven and may be equipped with four Hi-Speed Calrod surface units, two such units and a 12″ x 24″ automatic griddle, or a single 24″ x 24″ automatic griddle.

THE "HUSKY" OVEN

FOR ALL KITCHEN OPERATIONS

Now your kitchen can have that automatic temperature and directional heat controlled electric oven you have wanted so long. For these new "Husky" all purpose kitchen ovens are well within the reach of the average institutional budget. From angel cake to roasting turkey, they will do a splendid all round baking or roasting job for you. Then too, they are exceptionally fast—have that flash heat and punch to put the Chef through an unexpected swamping rush. Individual control of top and bottom heat, adjustable automatic temperature control, and each deck a separate oven make these the most useful to you. Available in one, two or three decks.

THE "HEAT MANAGER" SYSTEM

OF MODERN HOT FOOD STORAGE

Think of holding **mashed potatoes** good for eight hours—keeping cream of tomato soup without a sign of "breaking" all day!! Think of a hot food storage table which radiates very little heat — over which there are no dripping clouds of steam. A table without dripping valves or rusted water pans and without so much as a hint of that sour "Steam Table Odor." These are just a few of the reasons leading hospitals, schools and commercial establishments are rapidly adopting the new Edison-Hotpoint method of individually thermostatically controlled electric hot food storage units for tables and food carts. Ask your equipment house for a quotation.

THE "HEAT MANAGER"

LOW PRICED AUTOMATIC FRY KETTLE

Those luscious, golden brown, perfectly fried foods, literally "baked" in deep fat, add zest and pleasing variety to the general diet hospital tray or the school lunch. Many Hospitals and Schools, presided over by nationally known Dieticians use and endorse these accurately temperature controlled, fat saving Edison-Hotpoint electric fry kettles. The new fry kettle shown here is astonishingly low in price and even more surprisingly economical on both fat and electric energy consumption. Find out WHO uses and endorses EDISON-Hotpoint products before you buy.

ALSO A COMPLETE LINE OF AUTOMATIC ELECTRIC — COMMERCIAL RANGES, BROILERS, BAKING AND ROASTING OVENS, STOCK AND FRY KETTLES, GRILLS, GRIDDLES, WAFFLE BAKERS, HOT FOOD STORAGE UNITS

FOR SALE THRU LEADING KITCHEN EQUIPMENT HOUSES

STANDARD GAS EQUIPMENT CORPORATION

18 East 41st Street, New York, N. Y.

Other Conveniently Located Offices at: Boston Philadelphia Baltimore Aurora, Ill. Chicago New Orleans Los Angeles

"Play Safe" by specifying VULCAN Gas Cooking Equipment

Gas is considered the fastest, most flexible, economical and dependable of cooking fuels. But, gas cooking equipment must be designed to get the most out of gas.

When you buy VULCAN, you get the benefit of 50 years' experience in building gas cooking equipment. Vulcan has pioneered in most major improvements, many of which are patented and cannot be obtained in other equipment.

Vulcan Radial Fin All-Hot-Top range (patented) has 68% more heat absorption surface, assures better heat distribution, faster service and reduces fuel costs about 25%. Four-ring four-control top burner (patented) gives greater flexibility and economy. Insulated automatic heat controlled range ovens cut fuel costs 25-50%, reduce meat shrinkage as high as 66% due to low temperature roasting. Cooler kitchens, lower refrigeration and air conditioning costs, and improved working conditions result.

Vulcan heavy duty ranges are made in four sizes, with All-Hot-Top, open, fry and combination tops, with high shelves, salamander broilers and other attachments. Can be connected in battery with other equipment. A line of lower cost ranges with wide variety of tops and ovens is also made. Complete Vulcan line includes not only ranges, ovens, fryers, and broilers shown here, but also diet kitchen ranges, hot plates, bakers stoves, griddles, etc. Ask for VULCAN CATALOG and partial list of school and college Vulcan users.

CONSULTING AND PLAN SERVICE

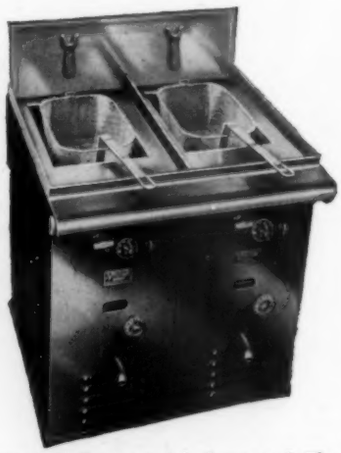
We will be glad to submit suggested layouts, based on many years of experience in laying out cooking equipment for schools, layouts that will save money both in installation and operating costs. Specification sheets can be furnished for most Vulcan numbers.

Hot-Top and Open Top Range with Ceramic Salamander Broiler.
Hot-Top fry, open and comb. top models. Insulated heat controlled oven. 39½" and 40" wide

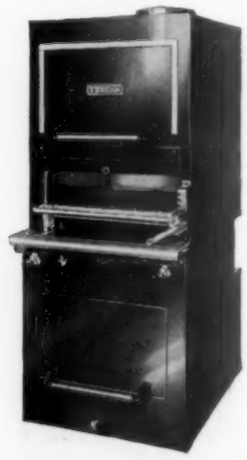
Battery of Vulcan All-Hot-Top Ranges and Broiler.
In Bayonne High School, Bayonne, N. J. Note fine appearance of equipment, and how easy it is to keep in clean and sanitary condition

Radial Fin Top Range with High Shelf.
Several other types of tops. Insulated heat controlled oven. 31¼" and 26½" wide

(Pat. Pend.)
Multiple Heat Conduit Bake Ovens.
Superior baking and roasting qualities due to multiple heat conduits which control and direct heat to every part of oven. Bakers tile lining. Extra thick insulation. Each section has automatic heat control. 55" W., 47¾" D., 24½" and 21" H.



Deep Fat Fryers with Immersed Flues.
Assure high quality fried food due to quick heat recovery. Save fat, fuel and food. Two sizes in both single and double unit types. Can be connected in battery with Vulcan equipment. Insulated, Automatic Heat Control



Heavy Duty Ceramic Broiler.
Produces superior product due to ceramic burner. 35% faster, uses less fuel. Finishing Oven. Insulated. Two sizes, 31¼ in. wide, 41¼ in. deep, and 26½ in. wide, 34¼ in. deep. Also made in smaller units, less oven

CRUCIBLE STEEL COMPANY OF AMERICA

Chrysler Building — 405 Lexington Ave.,
New York City

BRANCHES, WAREHOUSES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

REZISTAL—the pioneer of Stainless Steels—is ideal for school kitchens and cafeterias; for work, preparation and bakers' tables; sinks; steam tables; serving counters; refrigerators; and hundreds of similar applications.

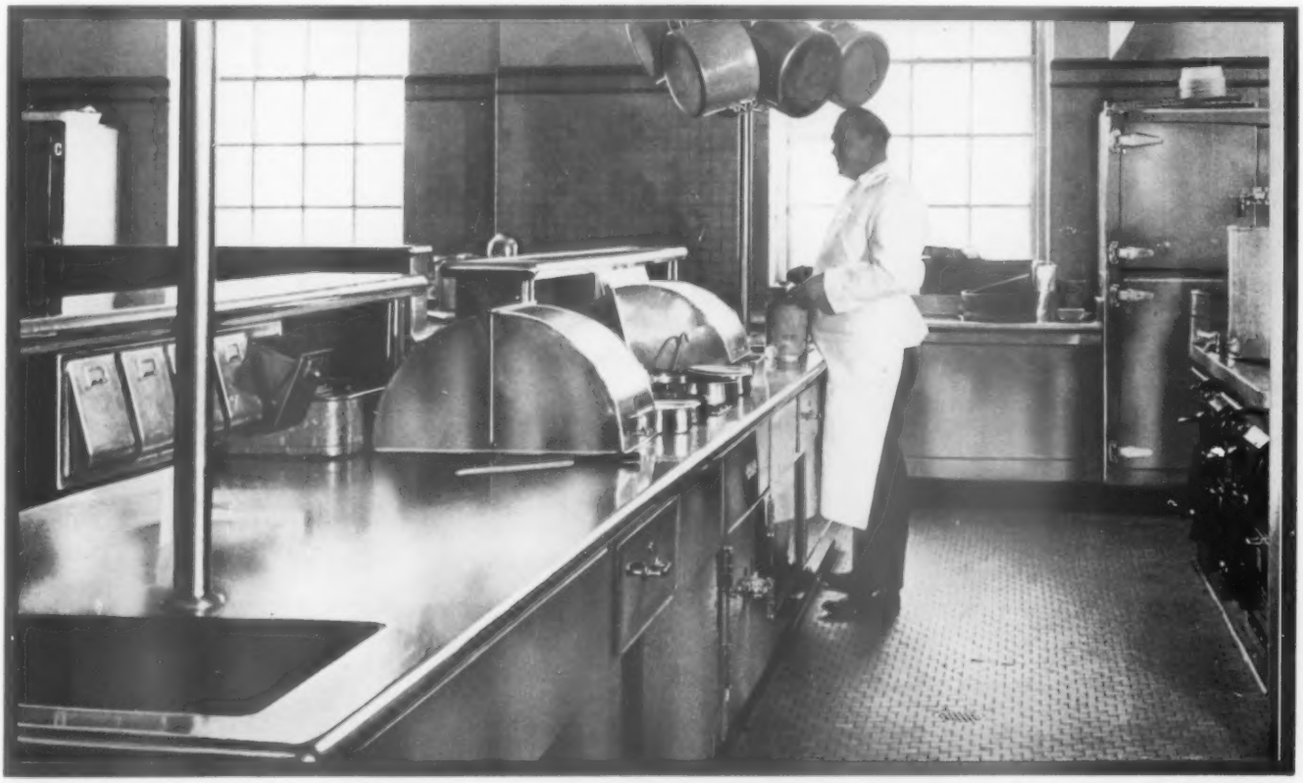
REZISTAL is not affected by any foods or food acids, does not tarnish or discolor, will not distort, and is not easily dented. It is smooth and easy to clean with a damp cloth or soap and water, thereby eliminating the necessity of buying expensive cleaning compounds. It is lustrous and silvery in appearance always—cannot chip, crack, corrode or wear away. It reflects that air of spotless cleanliness and sanitary conditions so essential in any school kitchen or cafeteria. There are REZISTAL stainless steels for every purpose and application, whether to resist corrosion or high temperatures, to reduce weight due to its high tensile strength, or for greater durability on account of its resistance to hard wear and abrasion. For permanent lustrous appearance combined with utility it is also most suitable for architectural and decorative treatments. For example, door kick plates, screen doors, spandrels, mullions, door jambs, hardware, window sills, stair treads, traffic and guard rails, and the like. Each have their type and finish in REZISTAL steels to suit the application.

REZISTAL STAINLESS STEELS

REZISTAL Food Storage Refrigerators

REZISTAL stainless steel **readily lends itself to fabrication** calling for the utmost in **sanitary** finished equipment, such as the rounding of coves and corners which eliminate crevices, wherein foreign and unsanitary matter might otherwise lodge. REZISTAL Corrosion-and-Heat-Resisting Steels are obtainable in plates, sheets, rounds, squares, hexagons, flats, strips and welding rods and are available through authorized distributors or any of the 26 Crucible Branch Offices and Warehouses.

REZISTAL costs no more than other good stainless steels. It will certainly pay to see that it is specified in your next school equipment order. Many years afterwards it will still be saving money! Save maintenance costs by specifying . . . **REZISTAL!**



Modern Sanitary Kitchen Equipment made of Rezistal Stainless . . . Dartmouth College

Modern Sanitary Cafeteria Equipment made of Rezistal Stainless . . . Dartmouth College

A FEW OF THE MANY SCHOOL, COLLEGE AND UNIVERSITY FOOD SERVICE EQUIPMENT INSTALLATIONS MADE WITH REZISTAL

INSTITUTION	FABRICATOR
Brooks School, Andover, Mass.	Jones McDuffee & Stratton Corp., Boston, Mass.
Columbia University (Teacher's College), New York, N. Y.	P. B. Polhemus Co., Roselle, N. J.
Conroy Jr. High School, Pittsburgh, Pa.	Bernard Gloekler Co., Pittsburgh, Pa.
Cumberland Senior and Junior High School, Cumberland, Md.	Bernard Gloekler Co., Pittsburgh, Pa.
Dartmouth College, Hanover, N. H.	Nathan Straus-Duparquet Inc., New York, N. Y.
Dennison Vocational School, Washington, D. C.	Federal Mfg. Co., New York, N. Y.
Duke University, Durham, N. C.	John Van Range Co., Cincinnati, Ohio
East Haven High School, East Haven, Conn.	Federal Mfg. Co., New York, N. Y.
Fitchburg High School, Fitchburg, Mass.	Morandi-Proctor Co., Everett, Mass.
Governor Dummer Academy, South Byfield, Mass.	Jones McDuffee & Stratton Corp., Boston, Mass.
Groton School, Groton, Mass.	Nathan Straus-Duparquet Inc., New York, N. Y.
Grove City College, Pittsburgh, Pa.	Bernard Gloekler Co., Pittsburgh, Pa.
Haldane Central School, Cold Springs, N. Y.	Federal Mfg. Co., New York, N. Y.
Holderness School, Plymouth, Mass.	Jones McDuffee & Stratton Corp., Boston, Mass.
Holy Cross College, Worcester, Mass.	John Van Range Co., Cincinnati, Ohio
Hope High School, Providence, R. I.	Morandi-Proctor Co., Everett, Mass.
Lincoln University, Lincoln, Neb.	Southern Equipment Co., St. Louis, Mo.
Livingston Manor High School, Livingston, N. Y.	P. B. Polhemus Co., Roselle, N. J.
Manlius High School, Manlius, N. Y.	Ruslander & Sons Inc., Buffalo, N. Y.
Mount Holyoke College, South Hadley, Mass.	Nathan Straus-Duparquet Inc., New York, N. Y.
New York University, New York, N. Y.	P. B. Polhemus Co., Roselle, N. J.
Philips Andover Academy, Infirmary Bldg., Andover, Mass.	Morandi-Proctor Co., Everett, Mass.
Philips Exeter Academy, Exeter, N. H.	Nathan Straus-Duparquet Inc., New York, N. Y.
Potsdam, N. Y. High School	Ruslander & Sons Inc., Buffalo, N. Y.
Principia College, Elsah, Ill.	Southern Equipment Co., St. Louis, Mo.
Rutgers University, New Brunswick, N. J.	John Van Range Co., Cincinnati, Ohio
St. Lawrence University, Canton, N. Y.	P. B. Polhemus Co., Roselle, N. J.
St. Mary's Academy, Monroe, Mich.	Stearnes Co., Chicago, Ill.
Samuel Gompers High School, New York, N. Y.	John Van Range Co., Cincinnati, Ohio
Sarah Lawrence College, Bronxville, N. Y.	John Van Range Co., Cincinnati, Ohio
Southwest High School, St. Louis, Mo.	Southern Equipment Co., St. Louis, Mo.
Texas University, Austin, Texas	John Van Range Co., Cincinnati, Ohio
University of Kentucky (Students Union Bldg.), Lexington, Ky.	Southern Equipment Co., St. Louis, Mo.
University of Maine, Orono, Me.	Jones McDuffee & Stratton Corp., Boston, Mass.
Wellesley College, Wellesley, Mass.	Nathan Straus-Duparquet Inc., New York, N. Y.
Williams College, Williamstown, Mass.	Nathan Straus-Duparquet Inc., New York, N. Y.
Yale University, New Haven, Conn.	Stearnes Co., Chicago, Ill., and Morandi-Proctor Co., Everett, Mass.

Specialty Steelsmiths to INDUSTRY

CHRYSLER BUILDING · 405 LEXINGTON AVENUE · NEW YORK CITY
BRANCHES, WAREHOUSES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

CONSULT TELEPHONE DIRECTORY OR THOMAS' REGISTER FOR NEAREST OFFICE

WESTINGHOUSE ELECTRIC AND MFG. CO.

Mansfield, Ohio

Sales, Engineering and Service Facilities Available Through Branch Offices, Distributors and Local Dealers

COMMERCIAL REFRIGERATION

Hermetically Sealed REFRIGERATION

MEANS PROTECTED INVESTMENT . . . GREATER DEPENDABILITY . . . LOWER NET COST

THE heart of any modern refrigeration system is its mechanism. In Westinghouse Refrigeration this heart is hermetically-sealed inside an airtight case of solid steel to protect it from dirt, air, moisture . . . the things that cause conventional machinery to wear out. A lifetime supply of oil is sealed inside.

5-YEAR PROTECTION PLAN

Because of this sealed principle, Westinghouse can and does provide 5 years' protection on the sealed mechanism.

This extra protection is possible because the sealed principle gives greater dependability . . . less wear and tear . . . longer life. This means less service and repairs . . . extra years of trouble-free refrigeration and lower net cost.

Only Westinghouse provides hermetically-sealed units in a wide selection of refrigerators and refrigeration systems for all school and college requirements.

HERMETICALLY-SEALED WATER COOLERS

Westinghouse also provides the only complete line of water coolers with hermetically-sealed units backed by a 5-year Protection Plan. A wide range of models, with capacities for every demand.

CALL YOUR LOCAL WESTINGHOUSE DEALER, OR WRITE

Westinghouse Electric & Manufacturing Company, Section 9003, Mansfield, Ohio

THE ALUMINUM COOKING UTENSIL COMPANY

New Kensington, Pa.

Oakland, Calif.

BRANCHES

Baltimore, Md. Boston, Mass. Chicago, Ill. Cleveland, Ohio Kansas City, Mo. Minneapolis, Minn. New York, N. Y. Philadelphia, Pa.

"WEAR-EVER" GAS HEATED STEAM-JACKETED KETTLE

This kettle is ideal for use where cooking must be done for a large number of persons, but where steam is not available the year 'round. It will do everything expected of a regular Steam-jacketed Kettle operated on a steam line.

About 60 minutes are required to bring water to boiling point and create steam in the 60-gallon size of this type kettle. Made in seven sizes from 15 to 60 gallons capacity.

"Wear-Ever" regular steam-jacketed kettles which can be operated with steam or electricity are available in sizes from five to 300 gallons capacity.

"WEAR-EVER" ALUMINUM TRAY

After years of scientific research, metallurgists have discovered a formula for an amazing new alloy for trays, combining all of the ideal qualities for cafeteria service. Come in eight sizes—natural or alumilite finish. We invite you to put these new trays to a service test.

"WEAR-EVER" RANGE UTENSILS

The "Wear-Ever" line of heavy-duty aluminum ware includes everything needed in the form of range utensils—sauce pans, sauté pans, stock pots, etc.—all made of thick, sheet aluminum, every utensil stamped from single piece of metal without joints or seams and with extra thickness of metal where needed to resist wear.

For full information regarding these range utensils, see your regular supply house, or write for catalog.

"WEAR-EVER" PITCHERS WITH COOL HANDLES

permit easy and comfortable handling of hot liquids. Of course they are suitable for use with all kinds of liquids. These pitchers are available in capacities from one to five quarts.

There is a comprehensive "Wear-Ever" booklet on heavy-duty aluminum ware. It is FREE. Send for your copy. Address: THE ALUMINUM COOKING UTENSIL COMPANY, 11TH STREET, NEW KENSINGTON, PA.

CORNING GLASS WORKS

PYREX HOUSEWARES DIVISION

Corning, N. Y.

T.M. REG. PYREX U.S. PAT. OFF.

Advantages of Using "PYREX" Brand Dishes In the Foods Laboratory

- Opportunity to teach family meal service in shorter class periods and with less effort.
- Better finished products, since beginners can see food baking.
  Practically no danger of failure by scorching or undercooking.
- Less storage space needed — one "PYREX" dish does the work of both cooking and serving dishes.
- More class time for constructive work—controlled laboratory tests prove that foods bake faster in "PYREX" Ware.
  Use of "PYREX" Ware means fewer dishes to wash with no lowering of good standards.
- Economical investment—saves the money that would otherwise be spent on separate cooking and serving dishes.
- Low initial cost—and a generous replacement policy.

NEW!

MATCHING SET

New Design Casserole — with Custard Cups
"Thin as Table Glass"

WRITE!

FOR CATALOG NEW LOW PRICES

Advantages of Using "PYREX" Brand Dishes In Cafeterias and School Dining Rooms

- Refinements in meal service — hotter food and better appearance of food at time of serving.

CORNING *means* Research in Glass

- Food saving — controlled tests prove that more food is eaten, instead of being wasted, when "PYREX" dishes are used.
- Lower breakage costs and a generous replacement policy

THE HOBART MANUFACTURING CO.

Makers of Electric Food-preparing and Dishwashing Machines

Troy, Ohio

ATLANTA, GA., 336 Marietta St., N. W.
CHICAGO, ILL., 61 Wacker Drive
DALLAS, TEXAS, 2034 Commercial St.
LOS ANGELES, CALIF., 412 S. Los Angeles St.
NEW YORK, N. Y., 71 Madison Ave.
SAN FRANCISCO, CALIF., 929 Mission St.
ST. LOUIS, MO., 1935 Washington Ave.
SEATTLE, WASH., 2208 Second Ave.

CANADA: Head Office, 119 Church St., TORONTO

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES (Consult Telephone Directory)

HOBART MACHINES ARE SOLD THROUGH LEADING KITCHEN OUTFITTERS

Illustrations show representative models only; each line of Hobart Machines comprises a range of sizes to fit any application, from the smallest to the largest school kitchen

Hobart Mixers

Built in 3, 5, 10, 12, 15, 20, 30, 40, 60, 80 and 110-quart bowl capacities. They mix, beat, whip, blend, mash. With attachments they chop, grind, slice, shred, grate, crumb, sieve, strain, etc.

Hobart Air Whip Attachment (for Hobart Mixers only) supplies advantages in regular mixing bowl operations, by better aeration; improves cake quality tremendously; reduces mixing time as much as 30% to 40%.

Hobart Glass and Dish Washers

Automatic and semi-automatic models. They wash all tableware **clean,** with a high degree of sterilization, in the shortest possible time. They carry such exclusive features as Revolving Wash Arms and the patented Dual-Drive Conveyor.

Hobart Slicing Machines

The Hobart Electric Ball Bearing Slicing Machine combines the latest features in one machine. Ideal for all boneless meats, hot or cold, cooked or uncooked, bread, cheese, vegetables, fruits, etc. Convenient to operate, speedy, quiet, and easy to clean. Maximum safety. New model with Adjustable Pressure Feed and Hobart Stay-sharp Stainless Steel Knife.

Hobart Air Whip Unit

Introduces a superior method of whipping cream. In a few seconds it produces 3 or more quarts of whipped cream from 1 quart of liquid cream. It whips by **air,** keeping all the freshness and sweetness of the cream. More and better whipped cream dishes can be made at less cost.

Hobart Potato Peelers

Bring new savings in time and food costs. There are four sizes, with capacities of from 8 to 45 lbs. peeled in "no time" with negligible peel loss. Quiet, speedy and watertight, they can also be used for sweet potatoes, carrots, parsnips, turnips, etc.

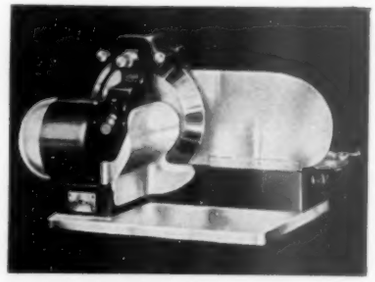
Hobart Food Cutters

Embody distinct advances in speed, thoroughness, safety, ease of cleaning, and economy of space. They cut up meats, vegetables, firm fruits, cocoanuts, citron, nuts, boiled eggs, beets—practically anything in the food line, uniformly in a few seconds' time.

GUARANTEE AND SERVICE

All Hobart Machines are fully guaranteed and serviced by **one** nation-wide organization. This avoids uncertainty, confusion and money-losing delays.

Peelers **Air Whips**

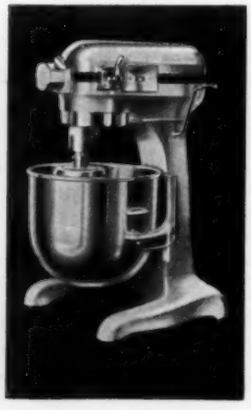


Food Slicers

Food Cutters

Dishwashers—*Left:* Compact, low-priced heavy-duty unit, "LM". *Center:* "AM-5" de luxe. *Right:* "XM-2," fully automatic

Mixers—*Left:* A-200, "two mixers in one" —20 and 12-qt. bowls. *Right:* M-80 Super Mixer



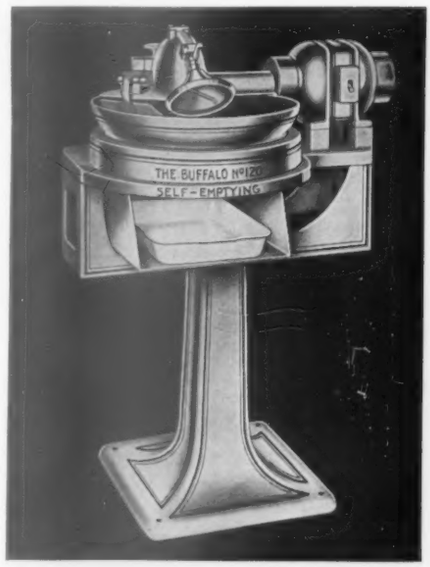
THE AMERICAN SCHOOL AND UNIVERSITY

JOHN E. SMITH'S SONS COMPANY

50 Broadway, Buffalo, N. Y.

Manufacturers of BUFFALO Food Cutters, Meat Choppers, Vegetable Slicers and Bread Slicers

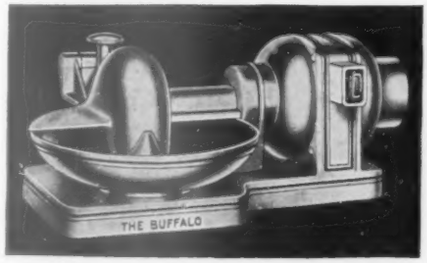
BUFFALO FOOD CUTTERS



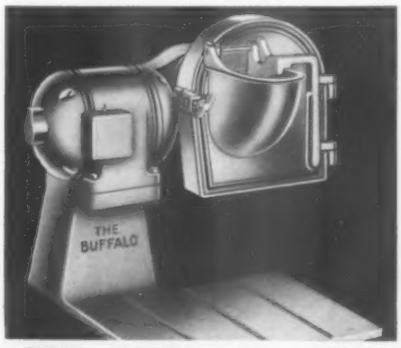
Any School kitchen, regardless of size, can reduce expense by installing a Buffalo Food Cutter. The savings in time and the reduction of waste have returned the cost of the machine many times over in hundreds of School kitchens. Buffalo Food Cutters are built in 7 sizes to fit varied requirements. All operate on the same principle—with crescent shaped knives cutting against a curved, slowly revolving bowl. The sheer, draw cut prevents mashing and improves the texture of the food. Any food—meats, vegetables, fish, fruits, etc., can be chopped equally well. Grinder and vegetable slicing attachments are available with all models. All Buffalo Food Cutters are equipped with safety switches and the knives are fully protected.

MODEL 120 BUFFALO FOOD CUTTER provides the exclusive Buffalo Self-Emptying feature. It is an easily operated, thoroughly sanitary device—simply a hole in the bottom of the bowl and a leak-proof plug which, when raised, allows the food to drop into the pan below. The entire operation is a matter of seconds and since the food need not be touched, there is no possibility of injury to the operator.

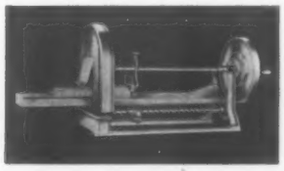
Capacity of bowl: 20 Pounds of meat
Motor: 1 H.P., fully enclosed, ball bearing type



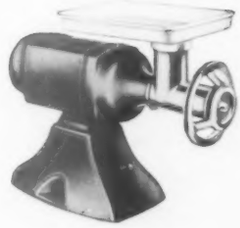
MODEL 114 BUFFALO FOOD CUTTER is designed for small kitchens. It has a bowl capacity of 7 pounds of meat. By swinging back the top plate the bowl lifts out for cleaning. Model 114 is available with or without pedestal. Equipped with ⅓ H.P. ball bearing type motor.



THE BUFFALO VEGETABLE SLICER is a sturdy, compact unit designed for a variety of purposes. It will slice or grate nearly all kinds of fruits, vegetables, nuts, etc. In addition to various slicing and grating discs, it can also be equipped with a meat grinding attachment. ⅓ H.P. motor.



THE BUFFALO BREAD SLICER saves two to three slices per loaf over hand slicing. It automatically feeds the loaf to the knife and cuts uniform slices at a rate of 175 to 200 per minute. The thickness of slice can be adjusted from ⅛″ to ⅞″. Made in 3 sizes, hand or power driven.



THE BUFFALO MEAT CHOPPER cuts clean with no backing up or mashing. It is fast, convenient, thoroughly dependable and entirely safe. It is available in 5 sizes with capacities of from 3 to 15 pounds per minute.

WRITE FOR COMPLETE CATALOG "BUFFALO KITCHEN MACHINES"

CHELSEA PRODUCTS

281 11th Avenue, New York

CAFATRAYS

Eleven Popular Sizes for THE Original ROLLED EDGE TRAY *Every School Cafeteria Purpose*

Facts About CAFATRAYS

● **Quiet**—They absorb noise . . . make no harsh clatter in handling, stacking or serving, even when hundreds are being used in the same room.

● **Sanitary**—CAFATRAYS come up rich and lustrous after one dishwashing. They look clean, and what's more, they ARE clean. Their hard, smooth surface cannot absorb grease or food matter. They never stain, even from fruit acids.

● **Tough**—They are practically indestructible. We made them to stand the gaff of modern dishwashing machinery and all the banging around that modern food service gives. Years of service in some of the largest chain cafeterias in the country have proven their stamina.

● **Light**—CAFATRAYS are made as light as it is possible to make a tray and still achieve durability.

● **Beautiful** — Their beautiful butt-grain mahogany color, cast in the body itself, never fades. And there is no surface lacquer or other super-imposed finish to wear away or mar.

Catalogue Number	Size	Weight Packed in Cartons of 1 Doz.	Prices
75	4½" x 6½"	2½ lbs.	$ .37½ (Ctn. of 12, $4.50)
1344	6 " x 8 "	4 lbs.	$ .57 (Ctn. of 12, $6.84)
1345	8½" x 11 "	7 lbs.	$ .90 (Ctn. of 12, $10.80)
1346	10¾" x 14 "	12 lbs.	$1.12½ (Ctn. of 12, $13.50)
1347	12¼" x 16½"	18 lbs.	$1.42½ (Ctn. of 12, $17.10)
1348	14 " x 18 "	23 lbs.	$1.65 (Ctn. of 12, $19.80)
1348½	15¼" x 20½"	34 lbs.	$2.40 (Ctn. of 12, $28.80)
1349	16½" x 22½"	48 lbs.	$2.85 (Ctn. of 12, $34.20)
1111	11" Round	8 lbs.	$ .90 (Ctn. of 12, $10.80)
1414	14" Round	14 lbs.	$1.42½ (Ctn. of 12, $17.10)
1616	16" Round	23 lbs.	$1.72½ (Ctn. of 12, $20.70)

NOW IN REGULAR USE AT—

Princeton University
Princeton, N. J.
Columbia University,
New York City
All Public School Cafeterias,
Seattle, Wash.
Fordham University,
New York City
Villa Maria Academy,
Malvern, Pa.
Cherry Valley Central School,
Cherry Valley, N. J.
Eastern Texas State Teachers' College,
Commerce, Tex.
All Public School Cafeterias,
Houston, Tex.
Dep't of Hospitals of the City of New York,
New York City
John B. Stetson University,
De Land, Fla.
Mountain Lakes High School,
Mountain Lakes, N. J.
Purdue University,
Lafayette, Ind.
Wyandotte High School,
Kansas City, Mo.
State Hospitals,
State of Missouri
Bureau of Printing and Engraving Cafeteria,
Washington, D. C.
Long Beach Schools,
Long Beach, Calif.

THE J. B. FORD COMPANY

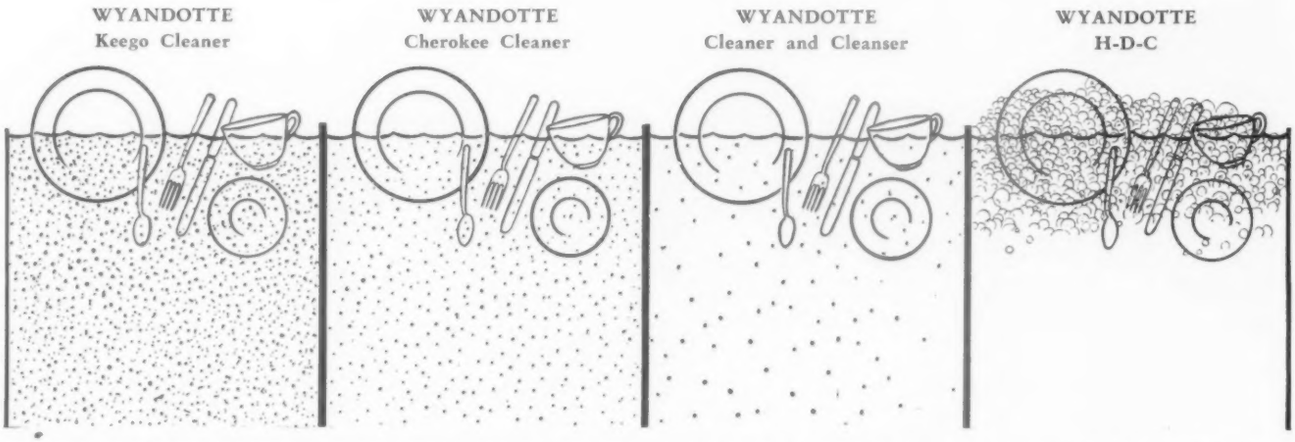
Manufacturers of Wyandotte Products

Wyandotte, Michigan

BRANCH OFFICES AND SALES REPRESENTATIVES IN 88 NORTH AMERICAN CITIES

JOBBERS IN 630 CITIES AND TOWNS

Ask for free copy of our 64-page book "School and College Cleaning"



WYANDOTTE KEEGO CLEANER —for excellent results in dishwashing by machine in even the hardest water.

WYANDOTTE CHEROKEE CLEANER —the best cleaner available for dishwashing by machine in medium hard water.

WYANDOTTE CLEANER & CLEANSER —for dishwashing by hand or machine in soft or only slightly hard water.

WYANDOTTE H-D-C—for dishwashing by hand in either hard or soft water when a suds-making cleaner is wanted.

WYANDOTTE KEEGO CLEANER

Counteracts the troublesome water-hardening properties of both calcium and magnesium. This is of the utmost importance to satisfactory Dishwashing.

Is an excellent cleanser for dishes, glasses, silver and cooking utensils. Keego Cleaner removes stains from dishes just by means of its use in dishwashing machines. It assists in preventing the deposit of any further stains on dishes. Eliminates the bother of a special stain removing dip for dishes in most cases.

Rinses so freely and completely from glassware that it lessens (and in many cases eliminates) the need for hand-toweling.

WYANDOTTE CHEROKEE CLEANER

Cherokee Cleaner is especially made to eliminate dishwashing troubles where water is of medium hardness. This cleaner makes an effective "dip" for removing stains from dishes. Also makes dishes, glasses, and silver bright and sparkling.

WYANDOTTE CLEANER AND CLEANSER

Is used for machine dishwashing principally in soft water sections, and where water is only slightly hard.

Wyandotte Cleaner and Cleanser is a very efficient and economical dishwashing material. It cleans thoroughly, and rinses easily. Cleaner and Cleanser is an effective washing material for culinary equipment and coffee urns.

FOR DISHWASHING BY HAND

Wyandotte H-D-C (Makes Suds)

This product is a thorough cleaner and produces excellent results in either hard or soft water. It is economical to use—only half as much being required as of soap powder. From 1 to 1½ tablespoonfuls to each gallon of water is all that is needed.

Wyandotte H-D-C is harmless to the user's hands. It is used for all culinary cleaning—dishes, glasses, silver, pots, pans, coffee urns, and kitchen equipment.

ALBERT PICK CO., INC.

Engineers, Designers and Manufacturers of School Cafeterias and Kitchens

2159 Pershing Road, Chicago

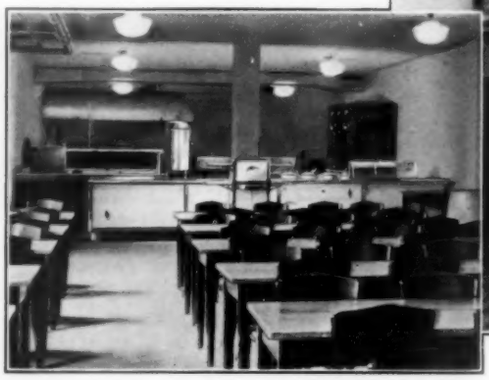
View of cafeteria counter in Thornton Township High School, Harvey, Illinois

PIX EQUIPMENT IS BUILT TO LAST NOT MERELY TO SELL AT A LOW PRICE!

Your first cost is usually the last when the cafeteria is built by Pix . . . and your food service is benefited by the planning experience and skill of Pix engineers who know how to make even a modest budget cover the feeding needs of the modern school.

In dealing with us, you have a definite assurance that the equipment is planned properly for its job, that all the specifications are scrupulously followed and that the true cost is actually lower because Pix equipment is built to give you many years of dependable and trouble-free operation.

View in kitchen of Carey Hall, Purdue University, Lafayette, Indiana



General view of dining room in Hillsboro High School, Hillsboro, Ohio

Giant power brake in Pix equipment factory

General view in Pix engineering department

Scene in welding department of Pix factory

View showing section of Pix equipment factory

SEND FOR YOUR FREE COPY OF "WHEN THE LUNCH BELL RINGS!"

Every progressive school executive will want to read this interesting illustrated booklet on modern food service planning for schools. It is not a catalog but a detailed analysis of all the factors that must be considered when buying a new cafeteria, modernizing an old one or simply buying single pieces of cafeteria or kitchen equipment. Filled with photographs, suggested plans and typical menus. Sent free, without obligation.

IF IT'S FROM PIX IT'S RIGHT

NATHAN STRAUS-DUPARQUET, Inc.

Sixth Avenue, Eighteenth to Nineteenth Streets, New York City

Telephone: WAtkins 9-5200 Cable Address: "STRAUS," New York

DUPARQUET, HUOT AND MONEUSE CO.
BOSTON: 491 ATLANTIC AVENUE

DUPARQUET RANGE CO.
CHICAGO: 225-235 NORTH RACINE AVENUE

A RELIABLE SOURCE OF SUPPLY

Kitchen Equipment and Installations, Utensils, China, Glassware, Silverware, Furniture, Linen, Beds, Bedding

Section of Kitchen Equipment Department, New York Showrooms

UNIVERSITY AND SCHOOL EXECUTIVES

WHATEVER the capacity of your educational institution, we can be of service to you in providing equipment for cooking, baking, warming and serving food. Our experience goes back over a period of 100 years. Since 1838 we have furnished equipment and supplies for thousands of kitchens. Duparquet ranges and special kitchen apparatus have had long years of recognition as the highest in quality and the most durable in their particular field.

Nathan Straus-Duparquet kitchen equipment has been installed in many of the finest modern schools and colleges in the United States. The roster of these is too long to quote here, but we mention Fordham University, Dartmouth College, University of Notre Dame, Columbia University, Cornell University, Connecticut College for Women, Taft School, Phillips Exeter Academy, Bronxville High School and Peekskill High School as examples of our work.

In these and in many similar institutions, we have worked out kitchen plans in conjunction either with the architects or executives. Our large and experienced engineering staff is available for assistance and cooperation in the preparation of kitchen installation plans. When you have an equipment problem to solve, we will be glad to have you call on us for discussion, plans and estimates.

Our Supply Department covers the entire range of items needed for service and operation — China, Glassware, Silverware, Kitchen Utensils and Equipment, Furniture, Refrigerators, Linens, Bedding. We carry very large stocks and are prepared to give prompt deliveries as required.

Write us about any individual items of equipment or supplies that may be required. We will be glad to send you full information and estimates.

WRITE FOR A FREE COPY OF OUR CENTENNIAL CATALOG

It is a veritable encyclopedia for purchasers of food service equipment. It contains 2600 illustrations. Every executive responsible for School or College food service should obtain a copy

THE JOHN VAN RANGE CO.

525–555 Culvert Street, Cincinnati, Ohio

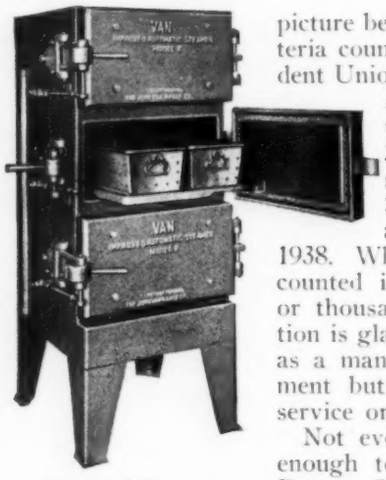
John G. Carlisle School, Covington, Kentucky

Like all other food service problems, whether it be hotel, hospital, no two school kitchens are alike, altho their problems are similar. John Van is ready to help you in the solution of such problems.

Send us the floor plan of the food service kitchen floors for any buildings that are in the planning stage, as well as permit us to counsel you on any reorganization planning which you have in mind for more economical service. The John Van Range kitchen engineers' analysis and recommendation may save you hundreds of dollars in operation or in purchase of necessary new equipment.

No matter how large or small your school, John Van can help. For instance, the above photograph shows the counter, and the kitchen in the background, for this Covington, Kentucky, Elementary and Junior School, with an enrollment of about 350 to 400. The

Student Union, University of Cincinnati, Ohio



Improved Steamer

picture below shows the cafeteria counter in the new Student Union Building, University of Cincinnati, where more than 205,000 meals were served between September 1, 1937 and February 1, 1938. Whether the meals are counted in scores, hundreds or thousands, this organization is glad to assist not only as a manufacturer of equipment but also as a trained service organization.

Not every school is large enough to use a John Van Range Steamer. However, where the school or college is large enough, such equipment is practically indispensable. John Van Steamers, in the three principal types—the Standard Model F, as illustrated at the left, the Pressure Type Automatic Steamer and the Cabinet Type Steamer, not only assure the scientific accuracy required in modern kitchens, but also bring economy of floor space, fuel and human effort.

This steamer illustrates ingenuity in design, care in fabrication, sturdiness in use, which characterize all John Van Range equipment for the preparation and service of food: ranges, sinks, counters, work and serving, work tables, steam tables, coffee urns, etc. Send us your inquiries for equipment.

TYPICAL JOHN VAN INSTALLATIONS

Northeast

Boston Public Schools	Boston, Mass.
Holy Cross College	Worcester, Mass.
Central and Eastern Senior High Schools	Lynn, Mass.
U. S. Coast Guard Academy	New London, Conn.
Brooklyn Technical High School	Brooklyn, N. Y.
Hunter College	Bronx, N. Y. C.
Pennsylvania State College	State College, Pa.

Southeast

University of South Carolina	Columbia, S. C.
Duke University	Durham, N. C.
University of West Virginia	Morgantown, W. Va.
University of North Carolina	Raleigh, N. C.

South

Caddo Parish Schools	Shreveport, La.
Atlanta University	Atlanta, Ga.

Southwest

University of Texas	Austin, Tex.

West

University of Colorado	Boulder, Colo.

Middle West

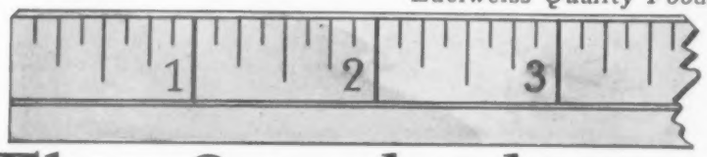
Purdue University	Lafayette, Ind.
University of Cincinnati	Cincinnati, Ohio
Michigan State College Union Building	Ypsilanti, Mich.
Lane Technical High School	Chicago, Ill.
Principia Academy	St. Louis, Mo.
John G. Carlisle School	Covington, Ky.

JOHN SEXTON & COMPANY

Manufacturing Wholesale Grocers

Chicago Importers Coffee Roasters Brooklyn

Edelweiss Quality Foods



The Standard of Comparison

CHICAGO

John Sexton & Co., welcomes comparison with any other food supply service for those who feed many people each day. Check the following facts about Sexton and Sexton service with the corresponding facts about any other similar service.

	SEXTON SERVICE	ANY OTHER SERVICE
1.	Established in 1883—continuously under Sexton management.	1. _____
2.	Responsibility—the highest.	2. _____
3.	Superb Service—Daily delivery New York and Chicago. All orders shipped within 24 hours of receipt.	3. _____
4.	Coffee Merchants for over 50 years. Direct importations—daily roasting—a saving to you in every pound.	4. _____
5.	All fruits and vegetables selected according to Sexton specifications. Uniform number of servings to the tin. All cans chock-full of fully ripened and delicious fruits or vegetables.	5. _____
6.	A complete variety of high quality preserves and jellies, gelatine desserts, extracts, baking powder made in Sexton Sunshine Kitchens.	6. _____
7.	Sexton pickles, rich in Oriental spices, pickled in pure vinegar and crystal cane sugar in Sexton Sunshine Kitchens.	7. _____
8.	Pre-eminent importers of Spanish olives—save buyers one profit.	8. _____
9.	Tender leaf teas imported from the Tea Gardens of Japan and India. Sexton teas retain the full volume of essential oils and theine found in the blossomed leaf.	9. _____
10.	A large staff of thoroughly trained salesmen, experienced with the needs of those who feed many people each day. A Sexton representative in every state in the Union.	10. _____
11.	Endorsed by the National Associations of the various enterprises feeding many people each day.	11. _____
12.	The Sexton guarantee of complete satisfaction or money cheerfully refunded accompanies every sale.	12. _____

BROOKLYN

If you are among the vast number of Sexton patrons, you have proved already the convenience and economy of these and other features of Sexton service. From all others we invite a trial order, the severest test you can make

THE TABLET & TICKET CO.

115 E. 23rd Street
New York, N. Y.

1019 West Adams St.
Chicago, Illinois

407 Sansome Street
San Francisco, Calif.

Since 1870

WILLSON'S GUMMED PAPER LETTERS & FIGURES

"As Easy to Use as a Postage Stamp"

THE PRODUCT

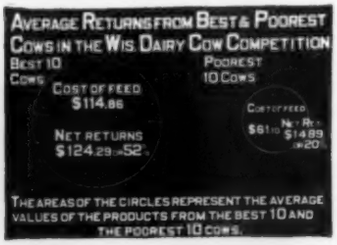
Willson's Gummed Paper Letters, Figures, Symbols and Tape are die-cut from best quality glazed, waterproof, gummed paper. They are easily applied and attractive in appearance.

PACKING

Letters and figures are packed 10 of a character to an envelope or 100 of a character to a box. Symbols are packed in boxes of 100 only. Assortments of 1,000, 2,000 or 5,000 characters are the convenient and economical method of purchase, the envelopes and boxes being purchased as refills as needed for the handy assortment boxes.

STYLES

Three styles of letters and figures are available —Cheltenham, Block and Gothic. These styles have been standardized because of their legibility and general acceptance as most desirable for display lettering. Sizes from ⅛-inch to 4 inches high.


AVERAGE RETURNS FROM BEST & POOREST COWS IN THE WIS. DAIRY COW COMPETITION
BEST 10 COWS
COST OF FEED $114.86
NET RETURNS $124.29 +52%
POOREST 10 COWS
COST OF FEED $61.10
NET RETURNS $14.89 +20%
THE AREAS OF THE CIRCLES REPRESENT THE AVERAGE VALUES OF THE PRODUCTS FROM THE BEST 10 AND THE POOREST 10 COWS.

USES

Willson's Gummed Paper Letters, Figures, Symbols and Tape are especially adapted for making flash cards, analytical charts and graphs, signs, indexes, marking files, records, maps, etc. Used in every type of educational and administrative work.

COLORS

Standard stock colors of letters and figures are white and black. Symbols and tape carried in white and black. Special colors cut on order. Send for catalogue.

MENU RACKS FOR YOUR CAFETERIA

"Entire Strip Changed with One Movement"

Willson's Gummed Paper Letters and Figures are used widely in school cafeterias, with our Ladder Menu Rack shown here, one of several types. Write for particulars on Cafeteria Sign Equipment.

CHANGEABLE SIGNS AND BULLETIN BOARDS

Changeable Letter Signs provide the ideal medium for transmitting thought by means of the written word, combining all the elements of expensive hand lettered or printed signs with greater efficiency, convenience and economy. But they go beyond the ordinary field of printed or hand lettered signs and find a broad, prolific industrial field as well.

Send for complete catalogue.

OTHER ITEMS WE MAKE

Desk Name Signs—Door Plates and Directional Signs. We also do die-cutting of all kinds

THE AMERICAN SCHOOL AND UNIVERSITY

SECTION X
LABORATORY DESIGN AND EQUIPMENT

SERVICING A MODERN LABORATORY—III
Acquisition of Apparatus and Supplies

By W. B. FOULK

Curator, Frick Chemical Laboratory, Princeton University

THE late Professor L. W. McCay used to compare frequently the equipment used by him while studying under Bunsen with that required by a graduate student of the present in conducting an investigation in pursuit of an advanced degree, to the disparagement of the student of today. He would point out that a beaker and a few flasks were all he had as tools, with the exception of such items of glassware as he constructed himself, in contrast with the multiplicity of apparatus and expensive equipment considered essential now. It is true that important investigations and experiments have been made of late, as well as in the past, by brilliant men with limited equipment, but the sciences have advanced at such a rapid pace that a wide variety of frequently comparatively expensive equipment is a prerequisite to most experimental work as conducted now. The educational laboratory is rare that has sufficient funds available to acquire all the equipment and supplies desired. The typical laboratory is not so fortunate. It is therefore essential that the funds available be expended judiciously, that the apparatus and materials secured be distributed and used wisely, if the annual budget is to be apportioned to provide even the most essential materials and services.

In previous articles appearing in THE AMERICAN SCHOOL AND UNIVERSITY, the writer has described at some length equipment and methods used in storing apparatus and supplies and distributing them to the students and research personnel, as well as for reclaiming and reconditioning such items for further service. In this article he will endeavor to show how economies may be made in purchasing supplies, together with methods of distribution that are incidental to these activities.

An efficient and accurate perpetual inventory, purchase records, filing systems for catalogs, quotations, invoices and other records, are essential to judicious purchasing. Anyone responsible for the acquisition of apparatus and supplies should have all these developed if they are not already available.

Filing Catalogs of Apparatus and Supplies

Of first consideration is an adequate catalog file. It is essential to know not only where apparatus and supplies can be obtained, but also how to specify them properly. The most satisfactory method of filing catalogs is in vertical files, and the correspondence size is the most useful. The catalog that is so large that it cannot be accommodated is rare. In developing filing systems for use here, the writer sought to avoid complicated and time-consuming methods, and also the error of wasting time in finding items by inefficient methods. In purchasing, correspondence and quotations are closely related, so a combination of correspondence and catalog file was developed. It was also thought desirable to make the matter filed available with the least amount of supplementary files and cross-references, so, based upon previous experience, the following method was adopted.

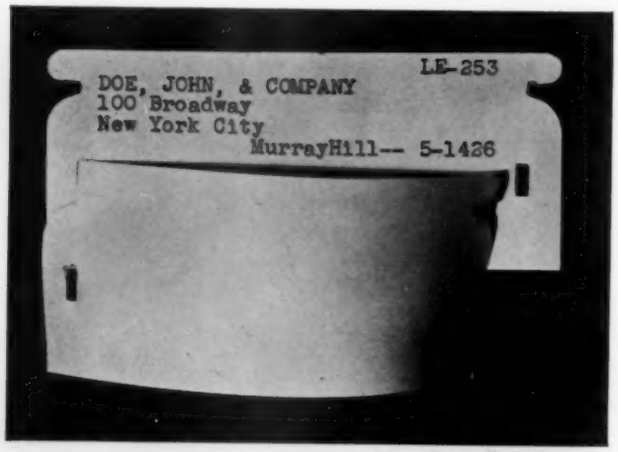
A combination of direct alphabetical and numerical filing was arranged. Alphabetical guides and folders were secured. The method used here differs to some degree from the usual application of these methods. In order to make it possible to locate by either the alphabetical or the numerical arrangement, a modified Dewey system of numbering was adopted. The combination of these two methods of filing required that some attention be given to the future growth of the files. A name list was first studied to see what percentage of names began with each letter of the alphabet, then numbers from 100 to 1000 were divided among the letters in such proportion. If a very large file had been anticipated, the numbers could have been from 1000 to 10,000.

The next step served a twofold purpose. Publications giving vendors' names, such as THE AMERICAN SCHOOL AND UNIVERSITY, Chemical Engineering Cata-

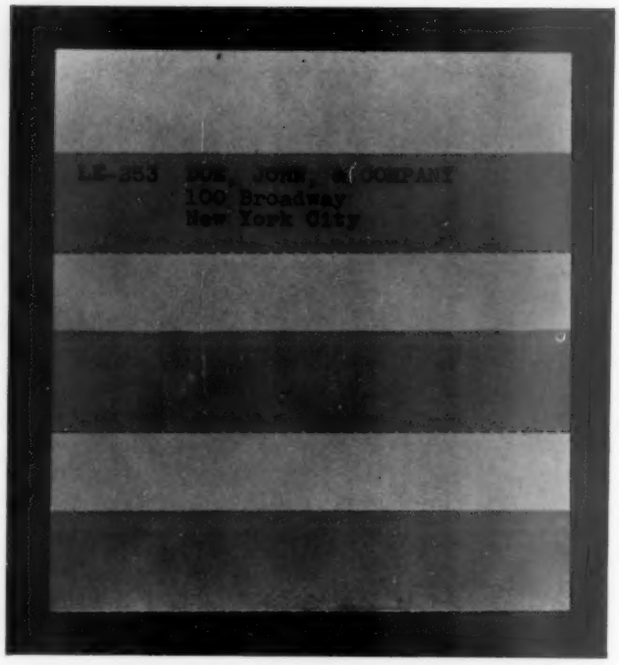
log, and even as large a reference as Thomas' Register, were consulted for names of products and their manufacturer or distributor that might be of use in this laboratory. A list of names of all the firms whose products might be useful was made, and the names of those whose merchandise seemed to be most likely to be used were starred, so as to write immediately for catalogs or descriptive literature. These names were then listed alphabetically with spaces between, and the numerals devoted to each letter were assigned in sequence to the letter names, and blank spaces as well.

When the catalogs were received, a folder was prepared with the number and name attached to the index tab, and the folder, with the catalog behind it, was placed in the file in proper numerical and alphabetical order. A label, with the proper number, was also attached to a corner of the cover of the catalog. All correspondence, including quotations, is filed in the folder of the respective firm and also given a number. Matter to be filed comprising only one or a few letters and associated pamphlets is put in a miscellaneous folder under the respective letter. Numerals were used because filing and refiling can be done more quickly and accurately with numerals than in observing the first letter or letters of a name. Secondly, numerals are more effective in cross-references where such are found to be desirable. The combined catalog and correspondence file is kept in the curator's office. By this direct alphabetical filing arrangement, the curator is able to find quickly the most-used correspondence and catalogs without the assistance of the file clerk or referring to the index file.

As the volume of correspondence and catalogs grew, it was evident that finding by this direct method could be accomplished more easily if the files were subdivided into classes. The following classifications were adopted for both the catalog-correspondence and the quotation-purchase files: Chemical, Electrical,



A visible index file makes a great deal of information available at a glance



Gummed label strips, in the appropriate colors, are used for attaching the firm names to the folders

Hardware, Industrial, Laboratory Equipment, and Furniture and Office Equipment and Supplies. The names and numbers were redistributed, using a separate alphabet and division of numbers for each group. As a further visual aid in filing, color band gummed label strips were used for attaching the names to the folders, and a corresponding colored card was used in the card holders on the front of the drawers in which the matter pertaining to each respective group was stored. At the same time, a letter designation was placed before the number to identify the group. Thus, the name of a firm whose catalogs and correspondence relate to laboratory apparatus and equipment is typed on a salmon color band strip as follows: LE-253 Doe, John & Co.

Although most matter is filed under the names of the firms, in some instances it was found more practical to file under the name of the commodity or group. A typical commodity group is Balances. When this method is used, the key number is assigned to the item as LE-160 Balances, the various catalogs and correspondence are filed behind the general guide, and that of each firm is given a sub-number, as LE-160.1 Becker & Co.

At the same time, a visible index file was developed. Cards of colors corresponding to the various groups were used. On these cards the file number, name, address and telephone number were typed. In some cases, a supplementary card was attached giving the name of the sales manager or sales agent to whose attention inquiries are usually directed. It frequently happens that an individual or firm acts as sales agent or distributor for several manufacturers. It may be

desirable to file descriptive literature under the manufacturer's name or under that of the distributor. In either case, cross-reference cards are inserted in the file. The same is done where a firm is succeeded by another, as past records indicate the former as the source of supply; also, one may recall the previous name of the company and not the latter, because of more frequent use.

The requirements of the various departments of educational institutions are subject to a yearly budget, and in most cases the department operates on a non-profit basis. Unlike commercial institutions, its administrative staff is not as much interested in frequent turnover as in keeping within the yearly budget and making it stretch as far as possible in acquiring equipment and services. In a research laboratory, it is impossible to anticipate all the requirements for apparatus and supplies, so that many items must be purchased as needed. However, in common with all laboratories, the requirements for the more commonly used materials which make up the larger portion of the items to be purchased can be accurately determined on the basis of the records of distribution during the previous year as shown by the perpetual inventories plus consideration of any possible increase in enrolment or personnel for the coming year.

Quantity Purchasing

It is of advantage to purchase the yearly requirements of such items at one time in order to purchase them most economically and, in reference to some items where specific quantity discounts are given, dependent upon the total quantity or value of the order, it is sometimes advantageous to purchase requirements for even longer periods. As an illustration, a 10% discount is given on Pyrex glassware purchased in case lots, and an additional 5, 10 and 15% if purchased in assorted case lots of 25*, 50 or 100 cases respectively. It is obviously uneconomical to purchase less than case lots of the most used items, even if the case quantity would be sufficient for two years or more. Furthermore, considering the many different items of general use comprising the line, it is poor economy to purchase items separately in even case lots when multiples of 25 cases offer an additional 5% discount in consecutive steps up to a maximum of 15% or a maximum total of 24½% of unit prices. If, for instance, a laboratory normally requires yearly any one of the 25-case multiples, it is an advantage to order one of the larger units, for the result is equal to being given an additional 10% discount on the second year's requirement as an inducement to warehouse it. This is true of other so-called franchise items, such as porcelainware, balances, optical equipment, electrical apparatus and other items sold under nationally known brand or firm names, their unit prices having been standardized by various means. It is well to consider future as well as present requirements in order to take advantage of quantity discounts.

Commercial institutions influenced by the profit motive do not consider this practice good business unless the discount is sufficient to offset the yield that the money might bring if invested otherwise. However, the personnel of an educational laboratory is interested in obtaining the most materials or services from the expenditure of funds provided. If even several years' supply of items regularly and continuously used are obtained out of funds from one year's budget, they do not have to be purchased during an equal period, and if other items are similarly purchased from funds available in the following years, it is apparent that more materials can be secured over a period of several years than could have been purchased if quantities sufficient only for immediate needs had been ordered.

Quantity purchases of competitive items also result in lower unit prices, and the same consideration should also be given to them. However, other factors must also be taken into account in regard to them, as the prices of such goods fluctuate. Business and labor conditions must be considered, to determine whether such articles will be cheaper or more costly in the future, in order to decide whether or not to buy what is required for a limited or an extended period.

Securing Quotations

The items and quantities of the materials to be purchased having been determined, the next consideration is how and from whom they are to be purchased. All conditions being equal, it is advisable to purchase from a dealer. The size of the institution, and the time and attention that can be devoted to the details involved in the complete transaction, are factors to be considered. The small educational or research laboratory will find it both advantageous and profitable to purchase most of its requirements through one dealer, or at least a limited number of them. As the amount involved will be small, the saving involved in "shopping around" will not be worth the trouble in comparison with the service your favorite dealer can give you. Many of the items ordered from him will be unprofitable to him to supply, but the total volume of your business will be appreciated and he will no doubt be of considerable assistance to you in securing materials difficult for you to locate, at an expenditure of time and attention on his part. If you choose reputable firms, you can place orders with them without the necessity of securing quotations, with the assurance that they will furnish the goods at the most advantageous prices. It is true that the larger concern is more likely to have the commodities in stock for immediate shipment;

* Since this article was written, the 25-case lot has been reduced to 20.

on the other hand, the size of a firm is no criterion of service. A small dealer may offset this advantage by more personal attention to your requirements and, because of a smaller overhead, may be able to sell you at a price advantage.

The larger institutions will find it profitable to have an experienced person devote more time to the purchasing of equipment and supplies and to securing quotations from several firms before placing orders. Whether or not the quantities and number of items are large or small, a list for quotation should be carefully prepared, stating the quantity desired, the catalog numbers as used by principal dealers, and the description of the articles required, together with sizes or dimensions. The description of the articles should be clearly stated. The items should normally be arranged in alphabetical order. In some cases it is advisable to group similar items together, such as graduated glassware, corks, rubber tubing, etc. The writer, from personal experience, believes that franchise items should not be included in a list for quotation. The prices on such articles are standard, and unless the whole list is to be placed with one firm, it results only in confusion concerning the more competitive items.

The list should be typed or mimeographed, according to the number to be sent out. A carefully prepared list is mutually advantageous to both the purchaser and the supplier, in that the quotation can be prepared with less difficulty by the bidder, assuring a more prompt quotation, and the prices submitted can be checked with greater rapidity and assurance.

A letter should accompany each list, outlining the conditions and terms on which the orders for materials are to be placed. A separate letter is better than stating these facts on the list, as it is more personal and also enables the sender to draw the firm's attention to specific items concerning which their previous quotation was not clear, or to refer to specific items appearing on the list previously supplied by them. We attach a questionnaire, as follows, to each of such letters:

Tear Off and Mail at Once

Do you intend to quote?.....
If so, when will your quotation be mailed? .....
How soon can you make delivery after receipt of order?.....
Do you wish your name retained on our bidding list?.....
If you are not quoting, state reasons.....
Firm name .....
Address .....

This makes it easy for the vendor to give the information desired, which is of considerable assistance in determining present and future action in doing business with the firm in question.

Incidentally, successful purchasing depends upon cooperation with the supplier by the buyer, as much as the reverse. Any transaction must be mutually beneficial if continued business relations are to exist. It is as important to make it attractive for the concern to supply the goods required as it is to afford a firm the opportunity of selling its merchandise. In addition to furnishing a clear and concise list of items on which to quote, assurance should be given that competition for the business will be fair. For this reason, as well as to assure the laboratory of securing satisfactory materials, standards of comparison should be established.

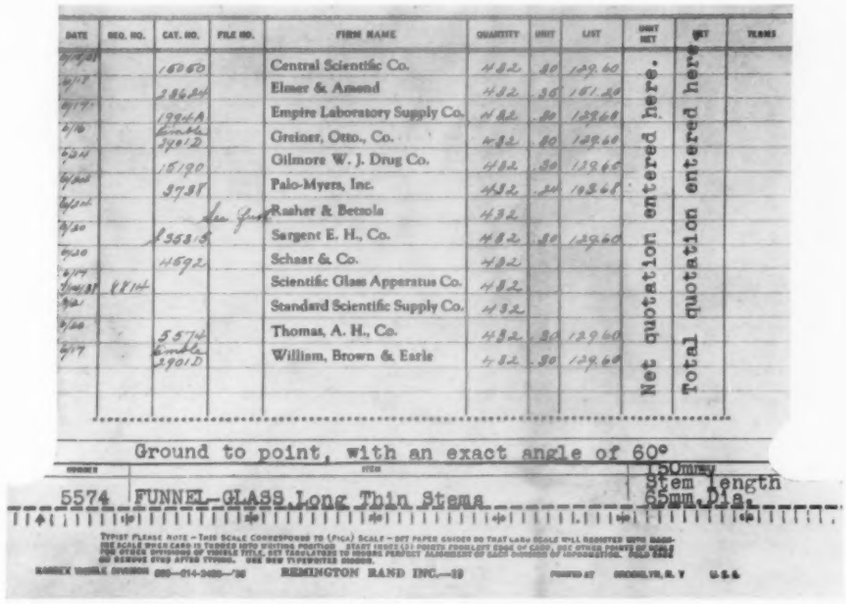
We do not agree to purchase any definite portion of the list from any one firm, and it is distinctly stated that item for item quotations will be considered. However, we do try to give as many items to each firm with which orders are placed as economical purchasing will permit, since this is to the mutual advantage of the buyer and the seller. Items previously purchased, if found to be satisfactory, are again placed with the same company, provided the price quoted is still in line. The firms invited to submit quotations should be selected with care. Their reputation and ability to render satisfactory service should be known before submitting a list to them. It is not desirable to request quotations from too many concerns, but it is well to receive prices from a sufficient number to be assured of purchasing to the best advantage.

The question concerning the advisability of purchasing through a dealer or direct from the manufacturer is a controversial one and therefore it is inadvisable to discuss it at any length. It is desirable to purchase most of the requirements for a laboratory through a dealer, and this method of distribution has its advantages in many instances. On the other hand, many items may be more advantageously purchased directly from the manufacturer, from consideration of both cost and service.

Comparing Quoted Prices

The lists having been sent out, the next important consideration is the method of comparing prices submitted. Quotation and purchase files are invaluable. The writer combines the two records to advantage in "Visible" record files. The files are composed of trays containing pockets in which the cards are inserted. The index line at the bottom of the card is visible through a celluloid strip at the bottom of the pocket as they lie flat in the tray. This enables individual cards to be quickly found and, as the pockets are hinged, they readily fold back, exposing the whole card, so that records may be made or referred to without removing the card from the file. A 6 x 4 card is used here for "quotation and purchase record." These are ruled as illustrated.

When a list is sent out for quotation, a quotation card is indexed for each item on the list. Complete specifications are typed on the card unless of consider-



"Name Card"

For comparison of quotations obtained from a number of sources

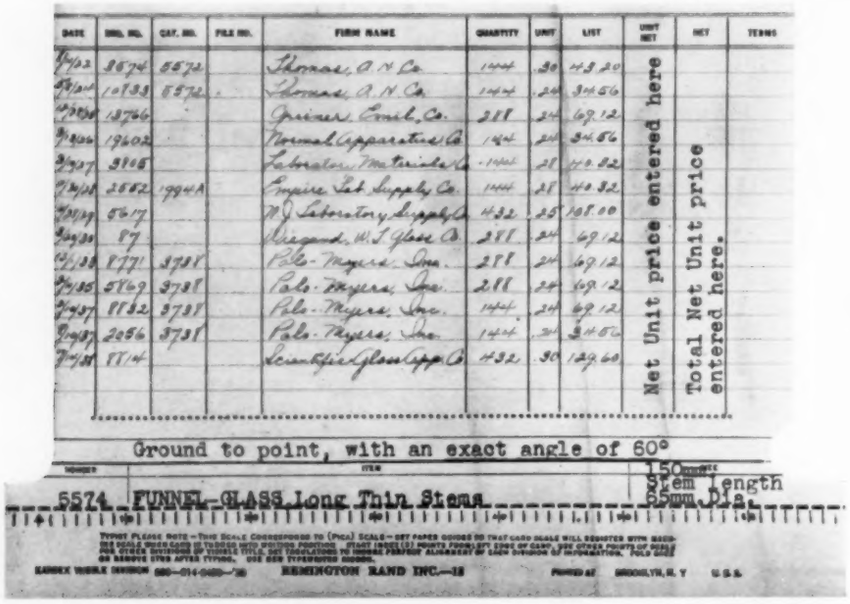
able length. In such instances the descriptive portion is typed on a 5 x 3 card and inserted in suitable slots on the reverse side of the pocket. When a number of lists are sent out, similar cards are used, with the exception that the firm names of the concerns which are usually invited to bid have been printed in alphabetical order on the cards. These cards are filed in a book-type tray in the same order as they appear on the lists. This enables a member of the clerical staff to enter the price on the card opposite the name of the company submitting the quotation, together with the date of quotation and the concern's catalog number. The fourth column on the card is used to enter any difference in size from the original list; or a notation, "See quotation," is made if the description differs from that appearing on the card.

When all the quotations are received, the person responsible for purchasing can quickly compare the prices submitted, putting a check mark opposite the most favorable price, at the same time inserting a colored celluloid signal in the index pocket to denote the firm on which the order for the item is to be drawn. These signals have several useful purposes. When all the cards have been checked, they tell at a glance on how many items the prices of an individual firm are low. If they are few, such items can be reconsidered to see whether it is advisable to order from a firm whose prices are favorable on a larger number of items. When the orders are being made out, the signal is moved to a different position, and when the purchase order is completed or a copy is received from the general purchasing agent, the order number is inserted and the signal moved to a corresponding position. In this way, an item is not inadvertently overlooked and not ordered. When the materials are received, the signal is removed from the file so that it is possible to tell at a glance what items are still outstanding and to urge their delivery if overdue.

As the quotations are being received and entered, a preliminary check is made periodically. Where prices quoted seem exceptionally low or high, a letter is written to the bidders asking them to check their quotation. This enables them to rectify any errors in quotation before an order is placed. On the other hand, after an order is placed, changes in quotation are not permitted, for this puts the buyer at a disadvantage if it is necessary to reorder the item elsewhere, beside taking time and trouble in redrawing a new order. During these preliminary checks, samples are requested from prospective suppliers if the items have not been bought previously from a particular firm and if the nature of the goods is such as to offer possibility of a variation in usefulness or quality. Every precaution is taken to prevent the necessity of rejecting the materials and of subsequent delay in deliveries.

Placing the Orders

When the final check is completed, the person responsible for purchasing underlines on the bidders' lists the items to be ordered from each concern, and at the same time rechecks the specifications and price extensions against the specifications and entries on the cards. The lists are then given to the stenographer, who types the requisitions or orders as the case may be. Checks for errors are further made by checking the requisition against the lists from which they were transcribed, and the order against the specifications on the cards, when entering the date of purchase and order numbers on the "quotation cards." If during these final checks doubt arises as to whether the



Permanent Purchase Record

Also used for entering both quotations and purchase records of materials purchased infrequently

materials offered will meet the requirements, the placing of the order may be delayed until samples are requested and received, or the order may be placed and instructions given not to ship until samples are sent, received and approved.

The method of purchasing differs in institutions. In some, the orders are placed directly by the department, in others by a general purchasing agent. The latter plan is followed here, but it has been recognized that the acquisition of scientific equipment can be secured satisfactorily only by a person familiar with both the apparatus and the requirements for it, so that all the procedure involved in securing apparatus and supplies is performed by the curator and his staff, with the exception of issuing the formal order, which is a function of the general purchasing agent. Cooperation and team work are essential among the curator and the purchasing and accounting departments if the best interests of the institution and the department are to be served.

Requisitions sent to the purchasing department should be typed, with full specifications. Where there are a number of items to be ordered from one firm, it is the practice in this office to type them on a separate list and to send the original and duplicate copies with a blanket requisition. By so doing, valuable time of the purchasing agent and his assistants is saved, since the purchase order can be made to read: "To cover miscellaneous items of apparatus and supplies in accordance with the attached list." The original list supplied with the requisition can be sent with the order, and duplicate copies attached to the duplicate purchase order. This not only saves time of retyping and checking but prevents possible errors in doing so.

When all the materials are received, the "quotation and purchase" record cards are transferred to the permanent visible file. Where a large number of quotations are secured on an item, and cards printed with the names of the principal suppliers are used, it is more convenient to make out a new one each time quotations are requested, so that over a period of years a number of cards for each item accumulate. For such items, a blank quotation card is put in the permanent file and always kept there. On this card the actual purchases are recorded, so that it is possible to compare prices paid and from whom the item was purchased over a period of years. Also, as it is sometimes necessary to replenish stock on a few items the demand for which has been greater than anticipated, this record card indicates the firms most likely to supply the item to advantage, and quotations may be secured from these or an order placed with one of them without requesting a quotation, with some assurance of obtaining satisfactory articles at a favorable price.

The "name card" is still useful. When a new list for quotation is to be prepared, a corresponding tray from the quotation file and perpetual inventory are placed side by side on the buyer's desk, and as the quantity of an article to be purchased is determined, the corresponding card in the quotation file is found, the amount to be purchased is noted on it, and it is slipped out of its pocket. When all the various articles are thus checked, the pile of quotation cards is handed to the stenographer, and as they have full specifications on them, the list is accurately typed without further attention on the part of the buyer. This results in a considerable saving in time in preparing the list.

A new set of quotation cards is then made from them, and the set from the previous buying period is filed in the book tray in back of the corresponding card for the current period. This enables the buyer to check the current prices against those that prevailed previously, also to refer to notations made on the cards as to whether or not samples formerly submitted or articles actually purchased were satisfactory. Thus they are useful in allotting items from the current list. When the cycle is again completed, the old set has served its principal usefulness and is filed away in an ordinary vertical card file for possible future reference, or discarded.

The various procedures followed in the use of these quotation cards may seem to be manifold and therefore to involve considerable time and effort. The preparation and filing of the cards on the part of the clerical staff becomes routine and does not require a great amount of time. The cards are extremely useful aids to the buyer and save much time and attention on his part in securing and checking quotations, also in ordering. The savings made in purchasing fully justify the time spent in preparing the cards and making the entries.

A Card File for All Commodities Purchased or Purchasable

So far we have been considering the use of the "quotation and purchase" files in connection with the more frequently used apparatus and materials listed in the catalogs of laboratory apparatus. There are innumerable articles, used to some extent in undergraduate laboratories, but more frequently in research laboratories, which are not listed in such catalogs or stocked by dealers in this field; also expensive apparatus and equipment, obtainable only from one source, or at least in limited number. It is the records of specifications, prices and source of supply entered on these cards that are the most valuable, since many things are purchased for a particular use that are never carried in stock and therefore do not appear in the perpetual inventory record. Considerable time and effort are frequently expended in obtaining this information. Often after long periods of time, it is important to have complete details relative to the characteristics of an article in question or to duplicate it. Frequently little more than the name is known, but if the practice is followed of putting a card in the file for everything purchased or even heard of, if it happens to be an unusual commodity, this information can be quickly obtained either from the card or from the purchase order, for this card file is also an index to the latter.

One of our professors who had little respect for business records and procedures found that the results of months of research were dependent upon knowing the purity of a gas contained in a certain cylinder among many similar ones he had used. He gave us the approximate date it was used. From our records, we were able to tell him what cylinder he had in use at a given period throughout the course of his investigation. In a very few minutes, we traced back to the purchase order and thence to the correspondence relating to the cylinder in question and gave him the information desired. He said that this single item of information was worth more to him than all the time and money we had expended on our record systems. The starting point to obtain this information was the file under discussion.

When our copy of the formal purchase order is received, the date and number are entered opposite the firm name on the quotation card, and the number is also placed on the duplicate copy of the requisition, which is then given to the receiving clerk, who uses it to check the receipt of the goods. The date, order number and quantity ordered are also entered on the respective perpetual inventory cards. The copy of the order is always kept in the administrative office. Until it is completed, it is kept in the active order file. If only a partial shipment is received, the requisition is sent to the office, where proper entries are made, and the requisition is then returned to the receiving clerk. Invoices are approved as soon as the materials are received, if they are found to be satisfactory, in order that the bursar may take advantage of all cash discounts, for they represent an appreciable saving during the course of a year.

The File of Orders and Invoices

All correspondence in reference to an order, duplicate invoices and all other papers pertaining to each order, are filed together. The orders and references are held in a completed file until the monthly statement of accounts is received from the bursar, in order to check it. They are then filed numerically in an order or bill file. Standard vertical steel bill size files are used which take folders 9¾ inches wide by 7½ inches high. These folders will take practically all sizes of orders and invoices. Where orders and invoices of correspondence size are used, as is the case with us, they are folded so that when filed the order is uppermost with the order number in the right-hand corner position. This enables orders and attached papers to be thumbed through rapidly while the folder remains in the file, or in the normal filing position if removed. Eight-point tab folders are used, numbered in consecutive hundreds as high as the purchase order series runs. It is wasteful of folders and filing space to use a folder for each individual order, and it is obvious that where there is a central purchasing agent only a portion of the orders will pertain to individual departments, so we have found that

units of a hundred hold our portion of the orders conveniently and the even hundred divisions are most easily located. Orders issued during a period of several years are kept in our active files, and as a new series is completed the oldest is transferred, but not destroyed, for through the quotation card record we can quickly locate any order no matter how old; it is not unusual to refer to an order issued twenty years before, for full particulars about articles acquired during that time.

In our case, and probably in all laboratories, there are interdepartmental requisitions for which a formal purchase order is not issued. There are also routine invoices for reprints, publication costs for reports of investigations, and a variety of charges of similar nature. All such requisitions and invoices can easily be filed and cross-referenced by having a separate series of numbers for them. We place a "D" before the numbers in this series to indicate departmental and to differentiate them from the purchase order numbers. Where there is no central purchasing and disbursement office, this system may suffice for all orders issued by the school or department.

Checking Quality of Goods Received

Reference has been made to standards for comparison of samples and of articles actually purchased. In competitive buying, it is essential to insist upon goods of good quality being furnished, for the protection of the laboratory as well as in fairness to the suppliers who propose to furnish and quote on first-class merchandise, so that in addition to writing our specifications as clearly as possible, we have adopted as many practical means of checking the quality of the goods supplied as possible. The first safeguard is to deal with only reputable concerns and to drop from our list those who after due trial do not give good quality and service. Next, it is important to inspect thoroughly samples submitted, and apparatus and supplies when they are received. Whether or not samples have been submitted previous to ordering, representative samples are selected from each shipment of every article. They are checked against the order in reference to general specifications, sizes and dimensions. All glassware is checked with a Polaroid strain tester for strains. Even glassware made by some of the nationally known manufacturers has sometimes been found to have strains. If the article shows so much strain that it is obviously of poor quality, the shipment is rejected. If the strains are not of a serious nature, the shipment is accepted. However, a letter is written to the supplier calling his attention to the matter, and a suggestion is made that he take it up with his source to see that such items in the future are better annealed. The results have been most gratifying, for certain items furnished previously containing strains have been supplied strain-free on the next order by the same concern. Glassware is also examined as to mechanical strength. As an illustration, test tubes may have sufficient wall thickness but have very thin bottoms. Wall thickness of lamp-blown glassware may be irregular.

While it is obvious that for some purposes accuracy of graduated glassware is less important in elementary courses than in more advanced courses or in research, we strike an average by specifying that all graduated glassware, with a few exceptions, must come within twice the tolerance of Bureau of Standards specifications. This is sufficiently accurate for ordinary purposes. Such a degree of error is not large, and anyone doing precise work is expected to calibrate such apparatus before using.

An empirical test of glass stopcocks, but quite satisfactory for ordinary vacuum work, is to remove all grease from the barrel and plug and to make a water seal. One arm is attached to a large-capacity filter pump or oil pump, and a globule of mercury inserted in the other arm. The plug is then slowly turned until the bore in the plug almost meets the holes in the tubes. If agitation of the mercury is observed, the stopcock is not tight. This of course will not check the vertical seating of the plug, but as large plugs and barrels are specified, leakage occurs in this manner less frequently, and if the plug is not fairly well seated, channels will appear in the water seal. If a stopcock is to be used for extremely high vacuum, it should be specified accordingly. Whether or not a stopcock is vacuum-tight can be determined only by inserting it in a high vacuum system and measuring the leakage of air through it by means of a McLeod gage.

Thermometers are tested by placing them in an oil bath and checking them against a calibrated thermometer to see whether the limit of error is within the tolerance specified. Observation is made to see whether the mercury separates on cooling or adheres to the walls of the tubing.

As we recondition our apparatus* of metal such as clamps, tripods, burners and similar articles, we are careful about the quality supplied us. In most cases, we are not interested in such articles made of special alloys but in securing sturdy, serviceable apparatus. We prefer cast iron clamps instead of pressed steel. Brass thumb-nuts and screws are always specified. All articles of metalware are inspected to see whether they meet dimensions, are well made and are of the metals specified.

The Purchase of Chemicals

So far only the acquisition of apparatus has been discussed. We will now consider chemicals and asso-

* See page 443, Ninth Edition, THE AMERICAN SCHOOL AND UNIVERSITY.

ciated materials. Unlike apparatus, the quality of chemicals can be judged only superficially by their appearance. An analysis is necessary to give any positive check. It is obvious, that owing to the large number of chemicals purchased in relatively small quantities by the average educational institution, it is not practical to have analyses made of each lot of chemicals received. Fortunately, it is not necessary. Rapid progress has been made in the standardization of purities and nomenclature of laboratory chemicals, also improvements in method of packaging. The laboratory chemicals of the highest purity are designated as Reagent by almost all reliable manufacturers, and as supplied by them conform to the specifications published by the Committee on Analytical Reagents of the American Chemical Society. As the prices of chemicals have become so standardized, it does not pay to "shop around" for them, particularly those of laboratory grade. A saving of only a few dollars on a large list of chemicals would result if the items were divided among several sources of supply. It is advisable in ordering chemicals to specify that the chemicals supplied shall be those of the manufacturer indicated on your list, the name of the firm to be specified being chosen from among the limited number of nationally known firms. This will assure the acquisition of chemicals of the highest quality. From whom the chemicals are to be purchased is a matter to be decided by each buyer.

Chemicals can be obtained in several grades, namely, Technical, U.S.P., N.F., C.P. and Reagent. The quantity purchased and the purposes for which they are used must be considered in the selection of grades. For elementary classes and Chemical Engineering, Technical and U.S.P. quality, if secured from reliable sources, are usually of sufficient purity. At one time all the above grades were purchased for use in our laboratories, especially when the courses in General Chemistry were designed principally for students who had not taken any chemistry in the secondary schools. Two conditions have caused a change in our specifications. The students entering the University who have previously taken courses in chemistry are now in the majority; hence, most of the several courses in first year chemistry are less elementary, qualitative analysis having been incorporated in most of them, so that chemicals of higher purity are required. Secondly, owing to the work of the A.C.S. Committee on Analytical Reagents, the differences between the purity of chemicals designated as C.P. and Reagent have been reduced along with the price differential. Formerly the term Reagent was usually reserved for chemicals of exceptionally high purity with a corresponding increase in price. Now, the majority of the chemicals that were designated C.P. have been improved in quality and are designated as Reagent at little or no increase in price. It is always desirable to reduce duplication and possible error in issuing and accounting for supplies wherever possible. When a number of grades of the same chemicals are carried in stock, the possibilities of error are greatly increased and the chances of stock depletion enhanced. For these reasons we have standardized on Reagent grade chemicals except where the amount used is relatively large or the price differential between grades is appreciable. As an illustration, the purity of the U.S.P. grades of iodine and the iodides of potassium and sodium is so high that they may be used even for analysis. Comparatively large quantities of these items are used, the price of them is relatively high, and the price differential between the grades is great. The Reagent grade of these chemicals is approximately 50 per cent higher than the U.S.P. It is apparent that Reagent grade should therefore be secured only when the importance of having chemicals of the highest purity is essential. There are others, such as sodium nitrate, comparatively cheap in price, but with a high price differential between the grades. There may also be a marked difference in purity. If large quantities of such a chemical are used in elementary courses, it pays to stock two grades. On the other hand, only comparatively small quantities may be used for all purposes, and in such circumstances it pays to stock only the highest purity.

Associated with consideration of the purchasing of chemicals is the consideration of frequency of use. If a chemical is used in laboratories of instruction as a continuing procedure, sufficient quantities should be carried in stock to prevent depletion. Also, if certain chemicals are of general use in research, they should also be stocked. On the other hand, if a chemical is only occasionally required, it should be purchased only when needed, to prevent possible deterioration before use and to reduce excessive inventories.

As a guide in purchasing chemicals, the writer caused a list to be prepared of all chemicals used in the laboratory as indicated by course requirements and previous purchases. Columns were ruled and headed in a manner that would indicate in which laboratories each chemical was used. By means of symbols, the use in each laboratory was indicated; i.e., as a dry salt, for solutions or both, and as an unknown in analysis for which purpose only small quantities are used. The extent and purpose for which the chemicals were used were next ascertained, after which the grade was indicated. By use of this chart the kinds and grades of all chemicals carried in stock are clearly defined. The chart assists in preventing chemicals of high purity from being used where those of less purity are entirely satisfactory.

Chemicals of high purity should not as a rule be purchased in bulk, but in such subdivisions as will insure their being used in a reasonable time after the container is opened. They should be issued for research purposes in sealed containers holding quantities required for immediate use. Of course, if very small subdivisions are purchased, the cost of containers and packaging is out of proportion to the cost of the substance. On page 303 of the Sixth Edition of THE AMERICAN SCHOOL AND UNIVERSITY the writer has discussed the system used here for subdividing the larger units in the laboratory to prevent excessive cost.

Use of the Metric System

The metric system of weights and measures is used almost exclusively in all scientific laboratories. It is therefore logical and also economical to secure chemicals in metric units, since they more closely conform to the quantities used and therefore there is less waste than when they are issued in avoirdupois subdivisions. It is also of much assistance in keeping accurate inventories. The writer has been purchasing most chemicals in metric units for the past twenty years and has had no difficulty in securing them in such units, although it has been expedient to order in sufficient quantities for approximately a year's supply in order to make it worth while for the supplier to package them in metric units. The reason that the metric system is not used generally for laboratory chemicals is the indifference on the part of buyers and users in educational and scientific laboratories. The outstanding manufacturer of organic chemicals has always marketed chemicals in metric units complying with the sizes recommended by the Committee on Guaranteed Reagents of the American Chemical Society. Two of the most prominent manufacturers of inorganic chemicals used the metric system in packaging their Reagent grade, but had to revert to the avoirdupois system because of competition. They stated that the educational buyers were indifferent and that they (the manufacturers) were placed at a disadvantage in competing for business with the industrial laboratories because the buyers were not familiar with the metric system and therefore demanded that avoirdupois units be supplied. If every user of laboratory chemicals would insist upon metric units being supplied, the system would be adopted universally in a short time.

The statement has been made that as a rule laboratory chemicals should not be bought in bulk—but there are exceptions to all rules. It will result in economy to purchase chemicals such as potassium and sodium hydroxide in bulk and subdivide in the laboratory. The bottling of the contents of a bulk container should be done at one time and under satisfactory climatic conditions. A large portion of the cost of such chemicals when bought in convenient units is the cost of the bottles and the labor involved in packaging. In every laboratory these bottles accumulate or are thrown away, so the only expense in refilling them in the laboratory is the labor involved, and this should be negligible, since every laboratory has some one on the service staff who could do this work at odd times.

There are other chemicals that can be purchased to better advantage in bulk direct from the manufacturer or principal distributor. Among these are industrial or Technical grade chemicals used in process demonstrations in the Chemical Engineering Laboratory, and other so-called heavy chemicals such as acids and solvents. If they are bought in subdivisions, the cost of the containers and the filling of them is entirely out of proportion to the value of the commodities. As an illustration, ether costs about five times as much in 1-pound cans as it does in drums of 300 pounds. The other generally used solvents cost in more or less similar ratios.

The above is true of mineral acids and ammonium hydroxide. However, this has long been recognized, and most laboratories purchase these commodities in 5-pint bottles or 12-gallon carboys. The price differential between these two sizes of containers is only 2 cents a pound, but a very large investment is involved for bottles and cases over that for carboys, in addition to considerable increase in transportation costs on the incoming shipment and the return of containers. It is therefore economy, when sufficient bottles have accumulated, to buy in carboys and refill the bottles for more convenient distribution in the laboratory. One of the leading manufacturers has recognized this fact and will upon request supply labels for use on bottles in refilling. In addition to the name of the acid and specific gravity, this statement appears on the label: "Institutional Refill from Original Container." Additional saving in transportation can be accomplished by buying the year's supply, or for any given period, at one time, provided storage space is available, and returning all empties at one time. This is especially true if within trucking distance of the plant, for the truck delivering the shipment can pick up the empties.

Where considerable quantities of compressed gases such as oxygen are used, periodic deliveries can be arranged and the empty cylinders returned in a similar manner.

It might be of interest to have some information about the service rooms and their equipment devoted to receiving and storing the commodities referred to in this article. Apparatus storage in our laboratories has been described in the Sixth Edition of THE AMERICAN SCHOOL AND UNIVERSITY, so that it is unnecessary to refer to it here.

The Receiving and Service Rooms

The service rooms, other than those from which apparatus and supplies are issued, are grouped around the receiving room on the ground floor. A service drive leads directly to the receiving room door. The entrance to the receiving room being at ground level, an unloading platform was built outside the receiving room at a height corresponding to that of the average truck, with a ramp leading down to the doorway. This is a great convenience in loading or unloading heavy shipments. The receiving room is 22 x 28 feet. Along one side of it, adjacent to the door and under the windows, is a table 36 inches wide, 18 feet long, and 37 inches high. The table has a monel metal top with shelves and excelsior bin underneath. A slope-top standing desk without legs was placed on it at one end for the use of the receiving clerk while standing, or seated on a high stool. Electrical convenience and gas outlets were placed above the table and have been found useful for various purposes, particularly the electrical outlets, to which the strain tester is connected, and also devices for numbering bottles and stoppers. For a number of years we have used for this purpose an electric motor directly coupled to a flexible shaft equipped with a hand piece as used by dentists. A mandril which holds small carborundum wheels is inserted in the hand piece. By means of this equipment, numbers and letters can be ground on stoppers, bottles, separatory funnels and similar items, so that the ground stoppers, plugs and parts fitting each other can be identified. Recently, an electric marker has been placed on the market, which we have acquired, and which is more convenient to use. It consists of a small motor and vibrator which actuates a hardened metal point. It can be grasped in the hand like a pencil. It is useful for writing on metal as well as glassware.

The purpose of this table is to afford a convenient place for examining materials comprising incoming shipments, and for preparing outgoing ones. As aids in the latter operation, a paper holder and cutter for paper 36 inches wide in rolls is also located on this table, together with a platform parcel scale. The shelves underneath are useful for storing materials used in preparing a package for shipment. In addition to the counter scale, there is also a portable platform scale of 500 pounds capacity for weighing the large units of incoming and outgoing shipments.

Along the wall at right angles to the long table is a combination steel table and shelving. This table is 30 inches wide, 10 feet long and 37 inches high. The shelves above it are 24 inches wide. The first two shelves are spaced on 20-inch elevations, the remainder 14 inches. The shelves have dividers on 36-inch centers to form bins, but the space between the table top and the first shelf was purposely left free of dividers to give an unobstructed table top. This table and shelving, particularly the bins in the first shelf above the table, are used for sorting items composing a shipment. An adjunct to this equipment is a movable table on large casters, 30 inches wide, 42 inches long and only 24 inches high. Boxes to be unpacked are placed upon it, and it is shoved against either of the tables mentioned. This places the box resting on it at a convenient height in relation to the other two tables, so that much effort is saved in unpacking, since the receiving clerk does not have to stoop and the passage back and forth from the shipment to the table is minimized. The unpacking table, being mobile, permits the box to be conveniently moved along as unpacking progresses.

It is frequently convenient to unpack directly onto the apparatus trucks used for transporting glassware and other items about the laboratory. Steel bank or vault trucks are very useful as apparatus trucks. Those used here have corner posts 4 feet high with three shelves 24 inches by 42 inches spaced equidistantly. The top shelf is 42 inches from the floor. By inverting the shelves, a guard-rail one inch in height is obtained. The trucks are equipped with two stationary and two swivel casters. This permits them to be propelled more easily, yet they can be turned in a narrow radius. It is advisable to have them equipped with rubber-tired casters, which make the trucks practically noiseless when being moved about.

Fiber carrier trays are also useful in handling glassware and other apparatus. We had them made 17 inches x 23 inches so that three of them would fit on a shelf of the apparatus trucks. They also have hand-holes and can be carried about individually. Fiber trays were selected because they are light and relatively inexpensive, also because fiber reduces the possibility of breakage of the glassware being transported in them.

Several kinds of trucks are also used: a barrel or two-wheel hand truck for handling barrels, boxes and carboys, a so-called dry goods truck consisting of a platform 24 inches x 54 inches mounted in the center on two large rubber-tired wheels 9 x 2½ inches, with two swivel casters 5 x 1⅝ inches at each end. This permits the truck to turn in a radius equal to half its length. It is useful for transporting some of the heavier equipment and furniture. A box truck or dolly is also useful for moving heavy and ungainly articles. The one we have is 16 inches x 27 inches, mounted on 4-inch-diameter heavy casters. As it is only 7 inches high, one end of a large object need only be lifted to permit the dolly to be slid under a sufficient distance for the object to be balanced on it. For its size, it is remarkable how much bulk and weight can be moved with it.

Two other trucks have been found very useful.

One is a truck for cylinders containing compressed gases. It is constructed somewhat like a barrel truck, except in proportion to a cylinder, and in place of the usual nose a flat plate is used that rests on the floor when the truck is tilted forward. This permits a cylinder to be placed on it without lifting. The other has limited use in the receiving room, but is especially useful around the laboratory. It has a platform 19 inches x 30 inches mounted on 10-inch-diameter rubber-tired wheels in the center of the platform, which is only 3 inches off the floor level. This was accomplished by using an exaggerated U-shaped axle. An offset swivel caster with 5-inch wheel was placed at the front, and a tongue attached to it. This truck was made in our shop. It is useful for moving equipment whose weight is disproportionate to its bulk and hence difficult to lift, such as heavy transformers, large vacuum pumps, and storage batteries.

The other two walls of the receiving room were left unobstructed to permit piling the units comprising shipments against them, thus leaving the remainder of the floor space free of obstruction.

There are three doors leading inward from the receiving room to permit rapid distribution. One leads into the gross storage room, the second to the corridor to the reserve storage rooms, which are equipped with closed steel shelving, and to the corridor to the elevator and other sections of the laboratory. The third door gives direct access to the glassware laundry.

The Glassware Laundry

The glassware laundry is one of the most useful of the service rooms. All incoming glassware that is dusty or soiled when received is routed into the laundry and washed before going into stock. We do not wash the glassware used by the students. We require them to check it back scrupulously clean, because we consider that a part of their training. However, it is only fair to issue glassware to them in the same condition if they are expected to thoroughly cleanse it before returning it. Washing is done for members of the faculty and for research personnel of post-doctorate rank. Here the bottles used as containers for chemicals, acids and solvents are thoroughly washed and rinsed with distilled water to prevent any possibility of contamination. The many bottles in which chemicals have been received or rebottled in our laboratory are washed and turned into stock, so considerable use is made of this equipment. Some research laboratories have adopted equipment similar to ours, and wash all the glassware used by the staff to much better advantage than if it were done by laboratory assistants in the individual laboratories.

The equipment of the glassware laundry, as may be observed from left to right of the illustrations, consists of a loading table, with sorting shelves above for the semi-mechanical glasswasher, and a two-tray alberene stone laundry tub with drainboard. Each tub is 24 inches by 30 inches by 16 inches deep. An auxiliary tub adjoins the drainboard, with a monel drainboard as a cover when not in use. Next in line is a 35-gallon steam-jacketed glassware-cleaning kettle, and a smaller one in the corner of 13 gallons capacity. On the far wall is a rinsing sink of sufficient size to permit the nichrome wire basket suspended from the monorail and chain hoist to be dropped into it. Adjoining this is an alberene stone rinsing sink 24 inches by 36 inches by 12 inches deep. It will be noted that all the tubs are equipped with swivel mixing faucets for hot and cold water. The last-mentioned sink also has a distilled-water faucet and an additional cold-water faucet to which is attached a hose connected to a bottle rinser that operates like a glass rinser in a soda water bar; that is, when a bottle or flask is pressed down on the rest, a stream of water shoots up into it, and when the pressure is released, the water is shut off automatically.

Along the third wall are the steam drying ovens, somewhat similar in construction to plate warmers used in hotels. The inside dimensions of the first oven are 24 inches by 66 inches by 22 inches deep. The steam coils in this oven are mounted vertically along the sides, and the shelves are of wire to permit the hot moisture-laden air to pass through. They are removable and rest on slides spaced 6 inches apart. This oven was designed for drying articles of unusual shapes and sizes. Shelves may be spaced at almost any desired interval or may be removed entirely for drying long tubes, condensers and other glass apparatus of exceptional length. The other two ovens are 44 inches by 66 inches by 22 inches deep. All the shelves in these ovens are stationary, spaced on 12-inch centers, with the exception of the top shelves, which are removable to give a height of 24 inches for exceptionally large beakers, bottles and flasks. The steam coils are placed horizontally under each of the permanent shelves, which are perforated to let the hot air and moisture rise to vents in the top. The ovens are all regulated to a temperature of 50° C. to obtain rapid drying yet prevent condensation of moisture on the inside and outside of the articles placed in them.

Another sorting table is located alongside the ovens, with shelves above as receptacles for the glassware when first removed from the ovens. A long, narrow table, 30 inches by 8 feet long with a shelf underneath, extends through the middle of the room and serves as a sorting and loading table. All the tables, shelves, and ovens were constructed of monel metal

Along the left-hand wall of the glassware laundry are the loading table, with sorting shelves above, a semi-mechanical glass washer, alberene stone laundry tubs, and steam-jacketed glassware-cleaning kettles

Rinsing sinks are located on the far wall, beneath the windows. Along the left-hand wall are the steam drying ovens and another sorting table, with shelves above. The table in the middle of the room is used for sorting and loading

as an aid to cleanliness and to prevent rust. All this equipment was designed as to size and shape to secure maximum service and efficiency from it, after having had several years' experience with equipment in a glassware laundry installed in our old laboratory.

The layout is along the lines of consecutive processes so important in industrial plants. The semi-automatic glass washer is useful only when there is a large number of objects of similar shape and size to be washed. The washer is essentially the same as used in cafeterias and restaurants, but the interior mechanism had to be considerably changed in order to wash chemical glassware, especially flasks, and particularly those with long necks. The washing solution and rinse water are forced through pipes. Inverted funnels were placed in the trays, so that when the trays are placed in the washer the water ejected from the tubes will shoot up through them. These funnels are equipped with short metal tubes in place of stems. Other tubes of varying length are placed over these tubes so as to give sufficient height to throw streams of washing solution up into the utensils to be washed. For instance, volumetric flasks require tubes of appreciable length. This equipment was not found satisfactory for washing miscellaneous equipment, and of all the equipment in the room it could be most easily omitted.

Recently, a rotary laboratory glassware washer has been placed on the market. It is the writer's present opinion that for washing laboratory glassware in general it is not as efficient as hand washing, but for glassware used in biological laboratories, particularly test tubes, culture tubes, pipettes and petri dishes, it would appear to have considerable merit, especially because it washes and sterilizes in one operation.

The process of washing glassware here is to place the articles to be washed in a detergent solution in the first tray of the laundry tub. Either trisodium phosphate or a mixture of sodium hexametaphosphate and sodium carbonate is used as a detergent, according to the type of soil to be removed from the glassware. The various items of glassware are washed by hand, using flask or beaker brushes to aid in the operation. The second tub is kept full of hot water by means of an overflow pipe, and the apparatus is transferred to it to dilute the detergent. A final rinse is made under a stream of warm water from the mixing faucet, and the articles are placed on the drainboard. The nichrome basket is lowered into the hot dichromate cleaning solution, and the glassware is placed in it in the lowered position so that it will sink down in the cleaning solution, the action of which will remove the stains.

After this operation, the basket is raised by means of the chain hoist if the kind of glassware will permit the cleaning solution to drain out. If so, the basket is transferred by means of the monorail and trolley until it is in a position to be lowered into the large rinsing sink. If the aperture of the glassware is so small that free draining of the cleaning solution will not occur, the basket is raised from the kettle a little at a time and the attendant removes the articles above the surface of the cleaning solution and completes the drainage, using a pair of rubber gloves to protect his hands. The glassware is then placed in the shallow rinsing sink partially filled with warm water, which is kept at constant level by an overflow pipe. The interior of the bottles or flasks is quickly rinsed by the bottle rinser previously referred to. A final rinse is given the inside of the glassware with distilled water. After rinsing, the glassware is racked in an inverted position, to facilitate drying, in wire baskets 13½ inches by 22 inches by 6 inches deep. The baskets are then placed in the drier, three to a shelf.

This method of washing and drying is fairly rapid. The glassware dries crystal-clear in a short time, free of alkali and chemical stains. With the equipment just described, one man can do the work of several with much better results.

Special Storage Rooms

It is advisable to have separate rooms, well ventilated, for the storage of acids, solvents, and chemicals of explosive or highly inflammable nature. The rooms for these purposes in the Frick Chemical Laboratory were deliberately put as far away from the ordinary chemical and apparatus storage as possible, for several obvious reasons, yet their location is quite accessible to the other service rooms. The acid and solvent rooms are 9 feet by 28 feet respectively and were put in a section that was least valuable for other purposes. Entrance to them is through the gross storage room.

One wall of the acid storage room was left clear for the purpose of stacking carboys, and cases containing acid in bottles, against it. Stacking is facilitated by an overhead I-beam to which is attached a trolley with a chain hoist. Against the wall of the other side of the room is a table constructed from alberene stone 2½ feet wide by 15 feet long and 37 inches high. Above this is a series of alberene stone shelves for the storage of the 5-pint acid bottles containing the several acids. Provision was made under the table for placing a carboy of each of the acids and ammonia and filling the bottles on the table above by means of a syphon arrangement. In addition to the table and shelving, a standard open-front fume hood was installed along the wall for use in pouring fuming acid and chemicals. The remainder of the wall space is occupied by an alberene stone sink and drainboard for use in rinsing acid bottles and utensils used in handling the acid. The sink is provided with both hot and cold water. The cold-

water faucet is threaded to take a hose coupling for use in flushing the floor through a floor drain. The floor is of industrial asphalt to make it acid-proof and is of course sloped to the drain. These provisions were made in case a carboy should be broken or acid otherwise spilled on the floor. If this occurred, it could be quickly diluted and flushed away. In some laboratories sand-pits have been provided for absorbing spilt acid, but it is the writer's opinion that a homogeneous acid-proof floor is more to be desired and that any spillage of acid can be more satisfactorily disposed of. A ventilation duct of chemical stoneware leads to a ventilating fan of sufficient capacity to assure a rapid change of air throughout the entire room and so remove any acid fumes.

The solvent room also has an asphalt floor with floor drain, and a smaller but similar sink has been provided for convenience. The solvent bottles are thoroughly washed in the glassware laundry, also the acid bottles if there is any possibility that they have been used as containers for any other liquid than the acid indicated on the label. Along one wall is a raised concrete platform 3 inches above the floor and 28 inches wide, with a pipe leg weigh-out table in the center. A solution scale is kept on this table. Above this is a canopy hood of corrosion-resistant metal with a strong vent for carrying off the free solvent fumes, although our method of storage and filling containers does not liberate the fumes to any appreciable extent. A compressed air line extends along the wall above the concrete step at a height of 40 inches, with cocks on 18-inch centers.

The solvents, in general, are secured in drums of 52-gallon capacity and are placed on the step in an upright position. When a solvent is to be bottled, a glass syphon tube and an air inlet tube that have been inserted through a stopper are placed in the small opening in the top of the drum. The air tube is connected to an adjacent air cock, and the solvent is forced out by air pressure. A vacuum line for this purpose is better but, as we do not have vacuum lines available, air was substituted, and it works quite satisfactorily. The bottles are filled in this manner. Definite weights of solvents are placed in the bottles to assure accuracy in distribution and accounting.

Solvent tanks with measuring pumps were considered when the solvent room was being planned. Aside from their cost, they offered several disadvantages. As the specific gravity of the solvents differs, pumps could not be secured with sufficient adjustment to deliver accurate quantities of the various solvents. Secondly, the drums in which the solvents were shipped would have had to be emptied into these tanks, with a corresponding increase in labor.

Along the opposite wall, directly in front of the filling table, is a desk or cabinet with drawers underneath for labels and corks used in connection with the bottled solvents. Flanking it on each side is steel shelving for the storage of both the empty and the filled solvent bottles.

The Dangerous Storage Vault is located underground beyond the building line. It is a chamber 10 feet by 12 feet and is connected with the gross storage room by a passageway protected by a fire door. It is ventilated by an independent ventilating system operated by natural draft. An opening has been provided at the top covered by a steel plate in such a manner that if an explosion should occur in the vault the steel cover would be blown off and thus relieve the pressure in the vault. Alberene stone shelves were placed along walls on two sides of the vault. The first shelf is 24 inches wide and was placed 37 inches above the floor to form a table or ledge in front of the remainder of the shelves, which are 12 inches wide on 12-inch centers. The smaller-size containers for highly inflammable chemicals are placed on these shelves above the table, and the boxes or drums under it. However, the number of items and the quantity of such materials used in an educational laboratory are relatively small. Cylinders containing highly inflammable or noxious gases such as acetylene, hydrogen sulfide and phosgene are also stored here.

Weighted fire doors held open by fusible links, and other types of doors that are said to close automatically in case of fire, are sometimes used on rooms or vaults used for the storage of solvents and inflammables. Spray nozzles connected to carbon dioxide cylinders located outside the rooms, which may be turned on in order to fill the room with carbon dioxide gas and thus smother the fire, are used in some laboratories. The location of such rooms in relation to the remainder of the building should dictate the extent of fire protection needed. However, the most effective fire prevention methods are those which will minimize the possibility of fires occurring, such as completely protected wiring and electric lamps. Secondly, no equipment such as electric appliances, gas burners and the like should be installed in or near such rooms.

Conclusion

An attempt has been made to show that conservation of the funds of a department or institution are dependent upon threefold activities: first, the knowledge of what and how much apparatus and supplies should be acquired, to prevent waste of money in securing larger quantities, or things that are not essential; secondly, purchasing the needed articles wisely by securing commodities of good quality at reasonable price; and, lastly, conserving the investment by preventing deterioration and waste both in the storage and in the use of supplies.

MAINTENANCE OF LIVING MATERIAL IN THE BIOLOGICAL LABORATORY

By JULIAN D. CORRINGTON

**Professor of Biology, Washington College, Chestertown, Md.;
Editor, Microscope Department, Nature Magazine**

Too often the biological laboratory of school or college reminds one of what the small boy called the old-fashioned natural history museum—a dead circus. Students must learn their anatomy, to be sure, from preserved specimens of earthworms and frogs; they must study prepared slides of stem and leaf sections; and box-mount displays of pinned insects will bring home such principles as protective resemblance, adaptation, Mendel's three-to-one ratio and the like. Models, charts, lantern slides, all have their legitimate and important place in the educational program. But when all is said and done, biology being the study of life, there is nothing quite so well calculated to catch the interest of the student as live material in the laboratory.

What can be exhibited and where shall it be placed? Conditions vary so greatly in different laboratories that even suggestions must be quite general. The large university will usually have separate rooms or even buildings for maintenance of living supplies—greenhouses, vivaria, basement tanks and so on; and then, more often than not, will neglect the opportunity of keeping samples from these stocks in smaller containers in the introductory laboratories. The result is that only the graduate students ever come in contact with living materials. Universities, like the smaller institution or the single room, can employ the time-honored window ledge and provide tables or benches along walls for aquaria, cultures and cages. Designs for new buildings could well incorporate plans for the exhibition of living collections, preferably in recessed aquaria and terraria which are to be reached for upkeep purposes from a narrow aisle in the rear or a catwalk above, and should be indirectly illuminated.

Courtesy of General Biological Supply House

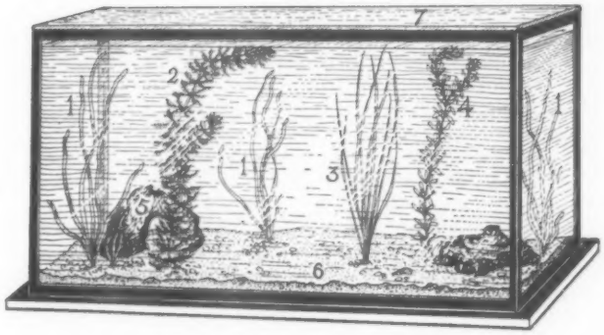
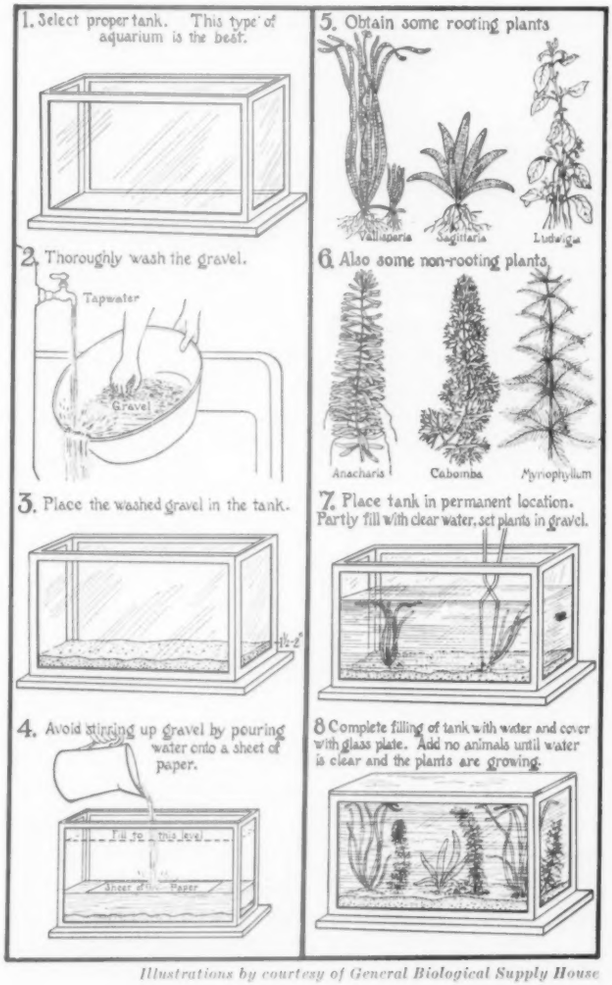


Diagram to show proper planting of a 9-gallon aquarium

1. Sagittaria
2. Myriophyllum
3. Vallisneria
4. Elodea
5. Rock
6. Sand or fine gravel
7. Glass on top of tank


1. Select proper tank. This type of aquarium is the best.
5. Obtain some rooting plants
Vallisneria
Sagittaria
Ludwigia
2. Thoroughly wash the gravel.
Tapwater
Gravel
6. Also some non-rooting plants
Anacharis
Cabomba
Myriophyllum
3. Place the washed gravel in the tank.
7. Place tank in permanent location. Partly fill with clear water, set plants in gravel.
4. Avoid stirring up gravel by pouring water onto a sheet of paper.
Fill to this level
Sheet of Paper
8 Complete filling of tank with water and cover with glass plate. Add no animals until water is clear and the plants are growing.

Illustrations by courtesy of General Biological Supply House

How to start a balanced aquarium

The Aquarium

The *balanced aquarium* is by far the most important single unit, and a great deal of information is available on this subject. Perhaps the best location in the average room will be a central window ledge, preferably with a northern exposure, eastern as second choice. Secure a rectangular aquarium of the largest size that will fit the space, and with it buy a sheet-glass cover, rubber tubing for siphoning, and a small hand dip net for transferring specimens.

In starting a new balanced aquarium, it is important that all materials be absolutely clean and sterile. The tank is to be washed and rinsed well, the sand washed in running water, and all the larger specimens passed through dilute permanganate or salt washes designed to kill harmful organisms. For the fresh-water aquarium, filtered pond water is best, though spring, well, rain or distilled waters are also good. Most city tap waters contain too many injurious metals or chemicals. There should be some two inches of sand on the bottom, the tank should be filled nearly to the brim and covered with the glass plate, and the whole protected by cardboard pieces from too much direct sunlight. One or two hours each day will do no harm, but no direct sunlight is necessary, and the denizens will thrive better if the temperature of the water can be kept below 75° F.

Most of the difficulties attending the running of such aquaria come from the natural inclination to overstock and overfeed. About one strand of plant to the gallon of water; one inch of body length of fish for every twenty-four square inches of water surface; no carnivores; no incompatible species; no animals that will not thrive in a confined space or adapt themselves to artificial conditions; no dead organisms or uneaten or spoiled food allowed to remain;—these are among the basic rules that cannot be ignored with impunity.

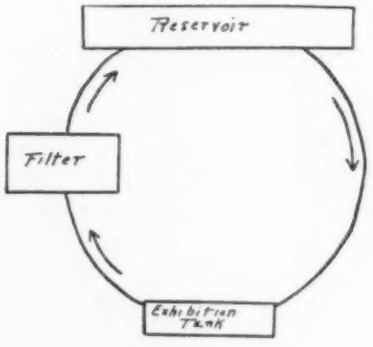
As an example, suppose we take the installation of a 6-gallon rectangular aquarium for balanced fresh-water life. If the tank has been used before, it should be thoroughly sterilized, using a strong salt or potassium permanganate solution, then carefully rinsed; if a new one, a complete cleaning is a minimum necessity, and a sterilization will do no harm. Add well-washed sand and place in the window, making arrangements at this time, if necessary, to regulate the amount of direct sunlight. Install the plants first, choosing two strands each of Vallisneria, Sagittaria and Myriophyllum. The first two have crowns and are to be rooted in the sand up to but not quite covering these crowns; Myriophyllum, or Elodea if preferred, should have the bottom of each strand weighted with a small lead sinker.

Put in two or three attractive and roughened rocks, add water to nearly fill the tank, spread the leaves of the plants, and put on the glass cover. Let it stand a few days, then introduce the animals. About four small fishes will be right, and they can be of one species or mixed, with sticklebacks, minnows, young bullheads and similarly interesting native forms preferred to such familiar household types as goldfish or

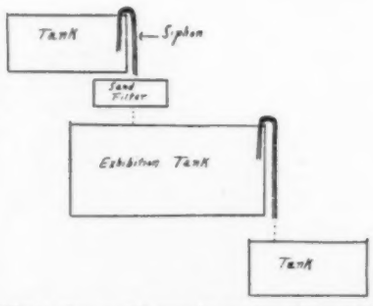
tropicals. One small aquatic turtle may be tried, but if it mutilates other animals it will have to be removed. Two newts or other small aquatic salamanders; one small fresh-water clam; six snails, either Reds, Planorbis or Physa preferred; and, finally, a quantity of such microcrustacea as Daphnia and Cyclops will complete the assemblage.

The plants should be aquarium-grown if possible, experience having shown that they will thrive better and are less apt to contaminate the tank with undesirable organisms. All these plants and animals except the crustacea should be passed through a bath made by adding sufficient crystals of potassium permanganate to give the water a wine color; plants one hour, animals one-half hour, then in each case rinsed well in running water. Such treatments go a long way in preventing subsequent infections with molds, algae and bacteria.

Experience and tinkering are necessary to obtain and maintain the proper balance. If the water becomes cloudy, it may be changed once or twice during the first two weeks, using the siphon method; but if this continues, there are too many organisms, and some of either the plants, or the animals, or both, should be removed. Keep the water level up to its original height, using the same source for additional supply. Should it become necessary to add tap water, do so only after having drawn off vessels of water from the tap and allowing them to stand uncovered for a week. Feed the animals sparingly, remembering that cold-blooded forms do not require the constant

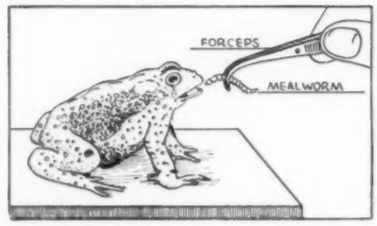


Large marine aquaria are usually planned so that a large reservoir of salt water furnishes a continuous, though rather slow, flow through the exhibition tanks



Siphon arrangement for a salt-water tank, which can be carried out on a small scale. The siphons need not operate continuously

Illustrations on this page by courtesy of General Biological Supply House, Chicago, Ill.



Toads, lizards, salamanders, etc., will frequently accept food held before them at the end of a pair of forceps

Showing the proper method of placing food in the aquarium

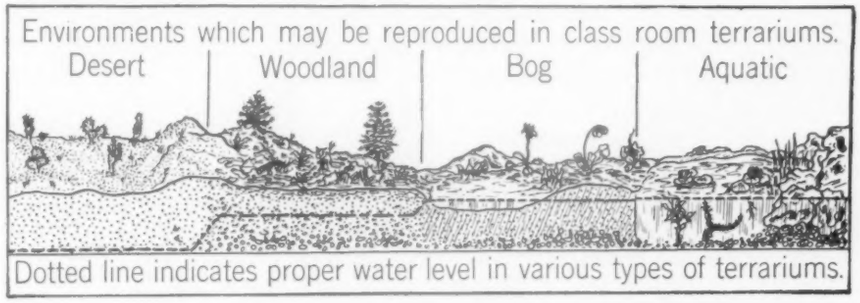
feeding essential for birds and mammals. Remove the newts to a fingerbowl of water and offer small earthworms, pieces of larger ones, or Enchytrae at the end of a forceps kept in motion. They will soon learn to feed, and after each meal will be replaced in the larger tank. The baby turtle and the fishes will take insects, worms, ant "eggs" (really the pupae) and prepared fish foods, while the remaining animals need no attention along culinary lines.

The *balanced marine aquarium* has been successfully maintained, at least for a period of time during which a class was working on marine invertebrates, in laboratories located far from the sound of surf. Such a display is much more difficult, however, and failure and discouragement are to be expected until some experience has been gained. The tank must have an aluminum and not an iron frame; the sea-water may be natural or artificial; the proportion of water and of water surface to number and size of animals must be much greater than in the fresh-water aquarium; and a low temperature must be constantly maintained. Devices for aeration, either in place of, or to assist, the attempt to balance plants against animals, are more important in marine than in fresh-water tanks, and take the form of small electric aspirators or motor-driven pumps. Space does not permit discussion here, but attention is called to the possibilities of having living hydroids, marine worms, starfish, snails and many other types in the laboratory.

A running-water hook-up with larger or more permanent installations is of course greatly to be desired, and permits bigger animals, greater crowding and less attention. Unless compressed air is available, the incoming water should fall from an elevation so as to facilitate aeration, and hence introduces an element of noise not always desirable. Often, too, the city water supply will be unsuited to aquatic life, necessitating an isolated unit plant including a storage tank of pond water, a sand filter and a motor-driven circu-

Right—The terrarium is sufficiently flexible to lend itself well to class use

Below—How to set up a bog or semi-aquatic terrarium


Environments which may be reproduced in class room terrariums.
Desert
Woodland
Bog
Aquatic
Dotted line indicates proper water level in various types of terrariums.

Courtesy of Denoyer-Geppert Co.

lation pump, with or without an air compressor, in addition to the exhibition tank itself. Naturally these outfits are costly and require considerable care.

The Terrarium

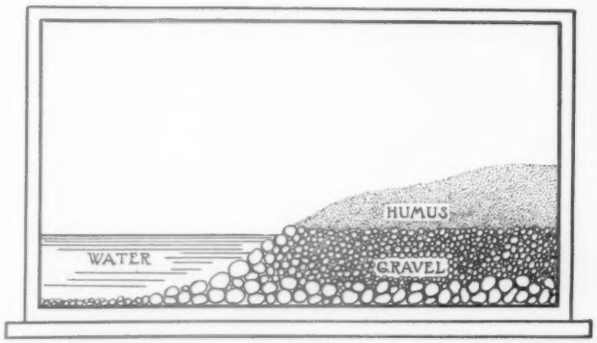
The balanced terrarium or vivarium is almost as well known and quite as interesting as the aquarium, and has the advantage of being much easier to install or sustain. As an example, the bog or semi-aquatic terrarium is one of the best and will house a great variety of both plants and animals. A large aquarium tank is supplied with a sloping layer of washed gravel, ranging from zero at one end to ten inches in height at the other, as illustrated. Ten inches of water is kept up continually, and the higher end of the gravel bed capped with acid soil from a bog. Covering this terrarium with a sheet of glass will insure constant humidity.

Suitable plants include sphagnum moss, ferns, lichens on rocks and small logs, and any other bog-dwellers, especially the highly interesting insectivorous sundew, pitcher plant and venus flytrap. Animals range from purely aquatic forms such as small bullheads, minnows, tadpoles, dragonfly and other insect larvae, crayfish, adult water insects, such as the diving and whirligig beetles, through amphibious types, such as frogs and salamanders, to terrestrial species, including sowbugs, centipedes, spiders, many insects, grubs and small snakes.

Animal Cages

Cages for larger animals may be purchased or home-made. Some of the rules to mention here, the ignoring of which will cause trouble, follow:

The temperature should be as nearly like that to which the wild organism is accustomed as the laboratory permits, and sudden changes are injurious. This means a careful selection of location of cages. If the temperature of the laboratory rises to 80° F. by day and falls to nearly freezing at night or over week-ends and holidays, good results cannot be expected. The same applies to humidity, most heated buildings having air that is too dry. If tropical species are kept in the same room with those from north temperate regions, one or both will suffer. Direct sunlight is



Courtesy of General Biological Supply House

necessary for snakes and alligators, but harmful to fish and frogs, and usually so to birds and mammals. Too much feeding is not so good for the cold-blooded forms, but birds and mammals must be fed daily. All types need an abundance of water, but something of the animal's habits should be known; for example, water for lizards is sprinkled upon leafy branches in their cage and they lap these drops as they would dew in nature. Water for birds and mammals ought to be changed each morning. Cleanliness is highly important to prevent parasitic infestations, especially in birds and mammals, whose cages should be cleansed daily. Overcrowding, with too many individuals in a small space, is likely to be very bad, though some forms, as frogs, can stand this condition if kept inactive in a cool, dark, wet situation, such as a covered basement supply tank.

Cages that will display animals to the observer's advantage are not always the best types from the occupant's standpoint. Certain animals require much concealment and shelter, and come out only at night or to feed; if prevented from following their natural instincts, they will not thrive well. Burrowing serpents, such as the rainbow snake, are extreme examples of this condition. Wire cages are best for birds and mammals, which need the extra ventilation thus supplied; but snakes and frogs will injure their snouts against wire and should be glass-enclosed, even though this entails frequent cleaning of the glass sides, which these animals soil by attempts at crawling and climbing. Weighted screen tops will admit air to such cages.

Cultures

As specimens for class work and investigation and also to serve as food for larger animals, certain forms have come to be widely used, and much has been written concerning their care and culture. Many of them are among the classics of the biological laboratory. The following suggestions may prove useful, though for intensive work one had best consult some of the appended references for a fuller discussion.

Many species of *algae* may be kept in vessels ranging from one- or two-gallon battery jars to regulation aquaria, with lids, placed on window ledges and supplied with pond water, preferably that in which the examples were collected. Some, as Spirogyra, do better when the bottom of the container has a thin layer of sand, and this should be soaked in formaldehyde overnight and then rinsed well in running water before using. Metals and their oxides are very injurious to algae, hence metal containers should not be used, and tap water is seldom advisable.

Chamberlain collects the smaller species of Spirogyra from quiet waters, and places a wad no larger than half the size of one's finger in a gallon jar of 0.2 per cent Knop's solution in distilled water, and finds these algae then likely to undergo rapid growth and cell division. After a week, conjugation is induced by transferring to rain water and keeping in bright sunlight. Zoospore formation in Vaucheria may be brought on by culturing in 0.2 per cent Knop's solution for a week, then changing to tap water and placing in the dark; in Oedogonium by changing from a lower to a higher temperature.

When algae disappear from healthy cultures, do not throw out the contents of the jars; let them dry out thoroughly, cover to exclude dust, and put away for a few weeks or months. When water is again added, new growths will shortly appear.

The usual procedure in working with *Protozoa* is first to secure and maintain natural cultures; from these, pure cultures of selected species are made, and from time to time subcultures, in order to insure plenty of material at all times. General precautions include a thorough sterilization and cleanliness of glassware, pipettes, water and hay or other culture media. Detailed work requires a binocular microscope.

Pond water, together with a number of algae and other aquatic plants, and some of the bottom mud, are collected and small amounts of each placed in fingerbowls, culture dishes, flat Stenders or Petri dishes, which are then covered and placed in diffused light but not in direct sunlight. A separate and labeled (or numbered) pipette is used for each culture dish. Examinations are made from time to time, noting what forms are present on the bottom, the upper surface, the sides of the vessel, and in the central fluid. Whenever a particular and wanted species is found, pure cultures are then in order.

Distilled water is placed in a selected vessel and several strands of boiled hay added, on which bacteria will develop and serve as food. After two days, inoculate with the desired form. La Rue recommends a mouth pipette, made by inserting a glass tube with a finely drawn tip in one end of a length of rubber tubing, 12 to 15 inches long, and with a short piece of glass tubing for the mouth at the other end. Using a binocular microscope, inspect a small dish of the culture and put the glass tube in the mouth. When the protozoan is located, bring the point of the pipette close to it and suck in; with a bit of practice the specimen can be captured and allowed to flow out upon a slide. Inspection will show whether or not other and unwanted organisms are present, and the process is repeated until the single protozoan is isolated and placed in the pure culture dish.

For growing Amoeba, some prefer adding a few grains of rice to a small covered dish of distilled water; others incline toward wheat, wheat straw, or rolled oats; rice grains planted in agar; or the regulation timothy hay infusion, at the rate of about six one-inch pieces to 100 cc of water. Euglena is best collected and cultured in water rich in organic matter and accordingly, in addition to hay infusions and rice cultures, horse or cow manure boiled in distilled water and then allowed to stand a few days before inoculating, is a favorite method. Brandwein prepares a Chilomonas culture by grinding 0.5-g of boiled egg yolk with a small amount of distilled water to make a thin, smooth paste. Add this to 500 cc distilled water, let stand for two days, then inoculate. If no Chilomonas material is available for this purpose, let the dish stand uncovered, when spontaneous inoculation will occur, the cysts of this organism seeming to be everywhere. Brandwein then subcultures and introduces various ciliates, as Paramecium, Euplotes, Colpidium and Colpoda, one species to a dish, finding that these do well on the egg-yolk medium when Chilomonas is present as prey. Didinium is cultured on Paramecium.

Hydra is easily maintained in the balanced aquarium, and the best food is Daphnia or Cyclops. Natural pond water should be used where possible. *Planarians* may be kept in white enameled milk-pans filled with spring or well water, covered to darken the interior and placed in a cool location. They can be fed enchytraeid worms or long thin strips of beef liver. If the latter is used, feed twice a week for three hours each, then remove the remaining liver, rinse the pan well and refill with fresh water.

Enchytraeid worms, which are small Oligochaetes, are widely used in feeding many invertebrates, as planarians, leeches, crayfish, and such vertebrates as

fish, salamanders and frogs. They are grown in a large dishpan or box filled with a rich garden soil to a depth of three inches. This soil is kept moist, but not wet, using a household watering can or laundry sprinkler top in a bottle of water for the purpose. Food is planted where the worms tend to congregate or in furrows lengthwise of the container, and consists of powdered crackers or dry bread, bread soaked in milk, cereals, or boiled potatoes. Feedings should be small, frequent and varied. Keep the container covered and as nearly as possible at a 60° F. temperature. *Earthworms* are kept in large boxes filled to the depth of a foot with a mixture of loam and decayed leaves, which latter constitute a sufficient food. Use the same precautions as to moisture, coverage and temperature as mentioned for enchytraeids, and do not overcrowd. One cubic foot of earth will support some fifty worms.

Of all laboratory animals, *Daphnia* has probably received more attention in the matter of culturing than any other, and recipes are legion. Manure, soy bean meal, cotton-seed meal, wheat bran, dead animals, yeast, algae and other media all have their adherents, the essential requirement being organic matter for the propagation of great numbers of bacteria. Perhaps the simplest technique is that of Hyman, who uses lettuce leaves. Bring some Boston lettuce leaves to a boil but do not continue boiling. Place in glass vessels with a 6-inch depth of water at the rate of one large leaf to each 6 square inches of bottom surface, and after three days inoculate with Daphnia. When the original leaves have disintegrated, add more from time to time, along with small pieces of raw liver. Use only moderate quantities and never allow the water to become foul or cloudy. Subculturing is necessary occasionally.

Probably the most easily maintained of food animals is the *meal worm* (Tenebrio, etc.), a beetle grub. LeRay and Ford recommend boxes 2 x 1¼ feet, 1 foot deep, of smooth galvanized iron to prevent the larvae from climbing out and escaping. A commercial mash for young chicks is placed on the bottom to a depth of ¼-inch, then four or five layers of burlap, with a sprinkling of mash between each two. Sprinkle the box with water daily. Inoculate with several hundred worms, and within three months there will be a huge supply. Mann uses shallow trays with an overhang to prevent escape of larvae, and a screen cover to retain adults. These trays are kept filled with bran, and occasionally a little potato, carrot or other vegetable is added for the adults.

Every biologist knows that *Drosophila* can be cultured on bananas. Formulas are varied, one of the simplest and most widely used being a banana-agar mixture, described by Bridges in 1921. Fresh ripe bananas are peeled and forced through a potato-ricer. For each 100 g of banana use 100 cc water and 2 g agar. Dissolve the agar in the water by boiling, remove from stove and immediately stir in the banana pulp. Fill half-pint milk bottles with 50 cc each of this medium. Add one drop of a water suspension of a fresh yeast cake, apply a folded square of paper toweling, and take out a plug of the material at one side, entirely to the bottom, to allow for escape of gas, pushing a corner of the paper into this hole to prevent formation of a well of liquid in which the adults might drown. As soon as the medium is cool, add the flies, and stopper with a cotton plug.

Another formula of Bridges that does not mold as rapidly as the foregoing is to dissolve 40 g agar in 2,000 cc water by bringing to a boil, at which time 200 g corn meal are added slowly with constant stirring. When well mixed, add 140 cc Karo corn syrup and 140 cc Bre'r Rabbit molasses, and allow to cook slowly for ten minutes. Do not overcook, or the mass will become useless through hardening. Remove from fire and pour at once into the culture bottles. Cut strips of paper toweling the length of the bottle, fold double, and insert in medium so as to provide a support on which the flies may crawl. Allow medium to harden, add one drop of yeast water-suspension, then bottles are ready for flies.

White rats are kept in cages having wire mesh bottoms with a removable tray beneath, so that urine and feces fall through and do not contaminate cage and animal. Clean cages daily and disinfect at least once each week. Place cages where they will be free from drafts, dust or direct sunlight, and give abundant food and water, the latter from one of the forms of sanitary drinking cup. Prepared foods as well as various deficiency diets are obtainable from a number of sources. For normal feeding, give rats the same variety as for yourself, with a mixture of vegetables, fruits, milk, cheese, bread and other items to make a balanced ration with all necessary vitamines.

References

Boulenger, E. G.: "The Aquarium Book." Gerald Duckworth & Co., London, England.

Chamberlain, C. J.: "Methods in Plant Histology." University of Chicago Press, Chicago, Ill.

"Culture Methods for Invertebrate Animals." Comstock Publishing Co., Ithaca, N. Y. Has full bibliographic references to original papers.

Hodge, A. E.: "Vivarium and Aquarium Keeping for Amateurs." H. F. & G. Witherby, London.

Innes, W. T.: "The Modern Aquarium." Innes & Sons, Philadelphia, Pa.

Mellen, Ida M.: Care of Small Salt-Water Aquaria." New York Aquarium, The New York Zoological Society, New York City.

Turtox Service Leaflets, numbers 4, 5, 6, 10, 13, 15, 16, 20, 23, 32, 33, 34, 35, 37, 39, 44, 48, 49. General Biological Supply House, Chicago.

Wistar Institute: "Breeding and Care of the Albino Rat for Research Purposes." Philadelphia.

THE GENERAL FIREPROOFING COMPANY

Youngstown, Ohio

BRANCHES
BOSTON—714 Beacon Street
CHICAGO—36 S. State Street
CLEVELAND—1235-37 Prospect Street
HARTFORD—8 Ford Street
LOS ANGELES—1733-35 So. Los Angeles Street
MINNEAPOLIS—310 N. First Street

BRANCHES
NEWARK—17 Academy Street
NEW YORK—500 Fifth Avenue
PHILADELPHIA—2301 Chestnut Street
PITTSBURGH—642 Grant Street
ST. LOUIS—521-523 Arcade Building
SAN FRANCISCO—534 Fourth Street

WASHINGTON—201 Mills Building

Dealers Elsewhere. Write for Name of One Nearest You

Metal Laboratory Desks and Tables
Built-in Metal Cabinets, Fume Hoods, etc.

(FOR METAL OFFICE, CLASSROOM AND CAFETERIA EQUIPMENT See Pages 382, 383)

GF Metal Laboratory Desks and Tables possess many advantages not common to other types of tables. Doors and drawers never warp, swell or split. Handles never pull off. Drawers never stick to cause broken glassware.

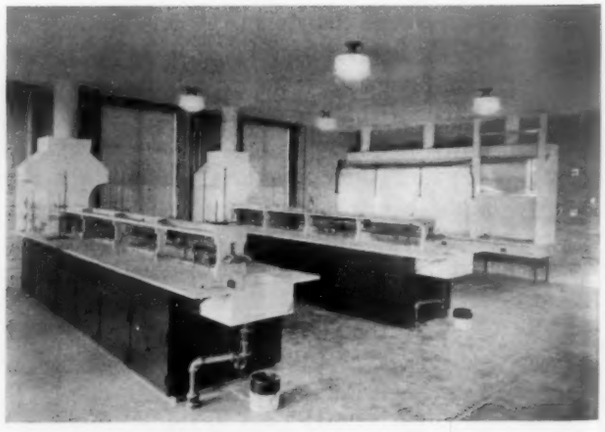
Built on the unit principle to facilitate installation and repairs to plumbing. Of non-combustible construction, they reduce the fire hazards of laboratories. Continuous tops of soap stone, asbestos or other compositions that resist acids, alkalis and solvents.

Complete engineering and consulting service for architects and building committees.

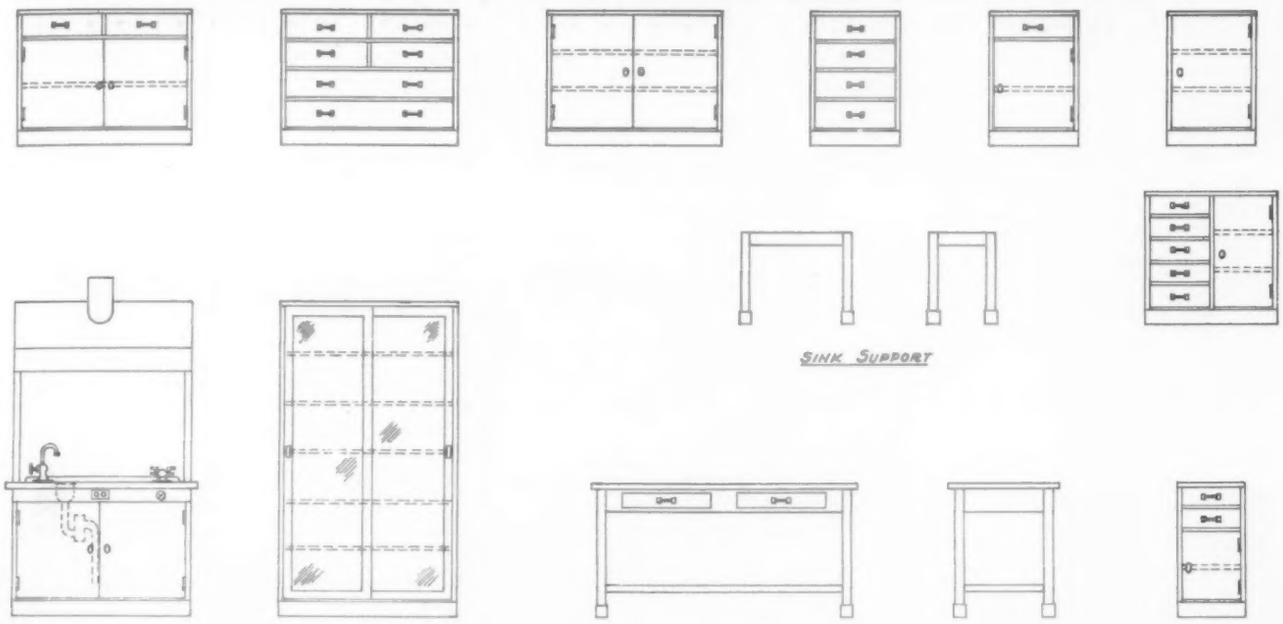
Chemical Laboratory, Princeton University

Los Angeles County General Hospital

Qualitative Chemistry, Ursinus College



Organic Chemistry, Ursinus College



TYPICAL LABORATORY UNITS

Research Laboratory, Aluminum Co. of America

Biological Laboratory, Ursinus College

Princeton University

Temple University

Temple University

KEWAUNEE MANUFACTURING COMPANY

Wood Furniture Plant and Sales: Kewaunee, Wis.
Metal Furniture Plant and Sales: Adrian, Mich.

C. G. Campbell, President

MID-WEST OFFICE: 1208 Madison St., Evanston, Ill., Tel.: Greenleaf 7026
EASTERN OFFICE: 220 E. 42nd St., New York, N. Y., Tel.: Vanderbilt 3-5459

DISTRIBUTORS IN PRINCIPAL CITIES

Kewaunee LABORATORY FURNITURE

PRODUCTS

Scientific Laboratory Furniture in Wood or Metal
Vocational Furniture — Home Economics Equipment
Library Furniture
Ever-Hold Automatic Adjustable Stools and Chairs

FREE CATALOGS

The Kewaunee Blue Book of Laboratory, Vocational and Home Economics Furniture
The Kewaunee Blue Book of Metal Scientific Laboratory Furniture
The Kewaunee Blue Book of Library Furniture
The Kewaunee Booklet of Ever-Hold Automatic Adjustable Stools and Chairs
The Kewaunee Blue Book of Home Economics Furniture (just issued)
The Kewaunee Booklet of Karcite Molded Ceramic Laboratory Sinks

PLANNING SERVICE

Available to our Clients without charge or obligation—Floor Plan Layouts—Mechanical Service Plans—Equipment Elevations—Specifications and Cost Budgets—Based on our 33 years of experience, exclusively in this highly specialized field.

A FEW OF OUR MANY RECENT OUTSTANDING INSTALLATIONS

METAL FURNITURE

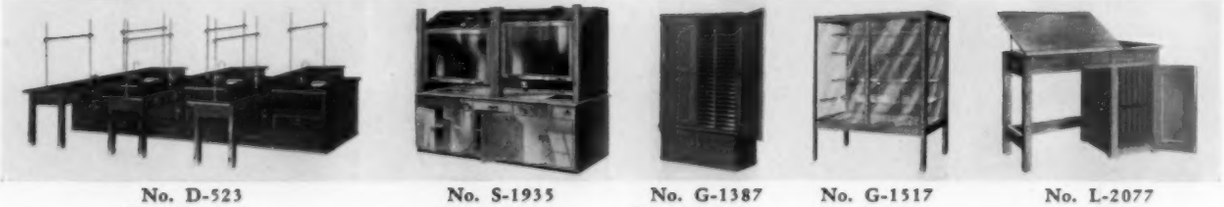
Mellon Institute, Pittsburgh, Pa.
Tuskegee Institute, Tuskegee, Ala.
Woodrow Wilson H. S., Washington, D. C.
Brookline H. S., Brookline, Mass., H. E. Dept.
Sr. H. S. Jewett City, Conn., H. E. Dept.
U. S. D. A. Extensible Bldg., Washington, D. C.
Institute of Paper Chemistry, Appleton, Wis.
Carlisle Jr. H. S., Covington, Ky.
Jr.-Sr. H. S., Malverne, L. I., N. Y.—H. E. Dept.
Cold Springs H. S., Cold Springs, N. Y.—H. E. Dept.

WOOD FURNITURE

U. of Ill. Med. and Dental Labs., Chicago, Ill.
State Teachers College, Bowling Green, Ky.
Chemical Labs. Lawrence Coll., Appleton, Wis.
Wyandotte H. S., Kansas City, Kan.
Sr. H. S., Miami Beach, Fla.
Univ. of Tenn. Biology Bldg., Knoxville, Tenn.
State Teachers College, Alva, Okla.
Chemistry Bldg., Lehigh University, Bethlehem, Pa.
Bayonne H. S., Bayonne, N. J.
New H. S., Robbinsdale, Minn.

Let us show you how you can rehabilitate your present laboratories to accommodate an increased enrollment of students with modern, efficient equipment — at reasonable cost

No. B-201 Physics Table — **No. C-304 Biology Table** — **No. S-1505 Instructor's Table** — **No. S-600 Karcite Sink**



No. D-523 Lincoln Desk — **No. S-1935 Fume Hood** — **No. G-1387 Notebook Case** — **No. G-1517 Trophy Case** — **No. L-2077 Art Table**

LABORATORY FURNITURE CO., INC.

Manufacturers—Engineers

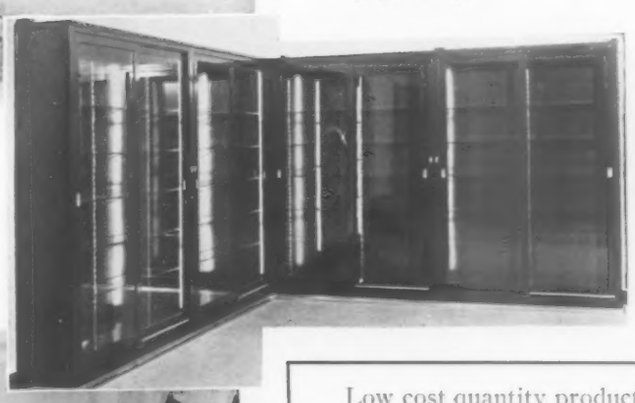
Long Island City, N. Y.

Medical College of Syracuse University, Syracuse, N. Y.
Dwight James Baum and John Russel Pope, Associated Architects

A "Steelab" Laboratory Furniture Installation is a *Lifetime Installation*

Chemistry Laboratory
Syracuse University

Like the modern building **"Steelab"** Furniture is built of steel and stone and is virtually indestructible by **fire, water** or **termites.** Unlike wood furniture it is unaffected by abnormal heat or moisture; the drawers and doors will never **warp** or **stick.** This durability and permanence is but one of a thousand reasons for **"Steelab"** popularity.



Museum Specimen
Cabinets
Syracuse University

Bacteriology Laboratory, Syracuse University

Low cost quantity production makes this Steel Laboratory Furniture available at a cost not exceeding the old-fashioned wooden furniture.

FREE—Engineering Service, Plans, Specifications and Budget Estimates. Avail yourself of the most modern ideas in Laboratory Planning without obligation. Write for catalog.

LABORATORY FURNITURE CO., INC.
37-22 Northern Boulevard
LONG ISLAND CITY, NEW YORK

ALBERENE STONE CORPORATION OF VIRGINIA

Quarriers and Fabricators of Alberene Soapstone
Virginia Alberene Stone, Black Serpentine and Tremolite Green

419 Fourth Avenue, New York, N. Y.

Quarries and Mills at Schuyler, Va.

BRANCHES

Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Cleveland, Ohio
Fort Worth, Texas
Newark, N. J.
New Orleans, La.
Philadelphia, Pa.
Pittsburgh, Pa.
Richmond, Va.
Rochester, N. Y.
San Francisco, Cal.
Washington, D. C.

ALBERENE SOAPSTONE

Natural quarried stone of medium hardness, blue-gray in color, produced and fabricated for more than 40 years; used in increasing quantities for:

- Table Tops and Backs
- Reagent Shelving
- Fume Hoods, Gutters
- Sinks, Drainboards
- Tanks and Tank Linings
- Toilet Partitions
- Shower Compartments
- Interior and Exterior Trim
- Door and Window Sills
- Fireplace Linings, Hearths
- Spandrels

VIRGINIA ALBERENE STONE

Selected stone of extreme hardness, reserved exclusively for Stair Treads, Landings, Platforms, and Flooring. Abrasive tests show the highest durability factor on the U. S. Bureau of Standards scale of any natural stone commercially used for these purposes. Its siliceous nature makes it non-slip wet or dry.

VIRGINIA BLACK SERPENTINE

This natural stone is becoming extremely popular. Its great resistance to weather action makes it desirable for exterior as well as interior work. When sand-blasted (as in spandrels) the fine tracery of the designs stand out against the polished black surface.

VIRGINIA TREMOLITE GREEN

An interesting addition to the line. In honed finish, shows clear white markings. Polishes to a dark green.

PHYSICAL AND CHEMICAL PROPERTIES

All grades of Alberene Stone are homogeneous and finely granular in all directions, dense and non-stratified, chemically resistant, impervious and non-staining. Alberene soapstone is easily machined—bored, slotted, grooved, tongued, turned—without splitting or spalling. Use of thin sections (⅞ in.) makes for economy.

METHOD OF CONSTRUCTION

Alberene laboratory fixtures are practically one piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corrosive metal cemented in grooves, with abutting slab edges sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented—permanently gas and liquid tight.

SERVICE IN DESIGN AND INSTALLATION

Every laboratory of major importance equipped in the past 40 years has used Alberene soapstone wholly or in large part. Out of this experience the company offers an advisory service, freely available to school and university authorities and architects.

MANUFACTURING FACILITIES

Quarries and mills at Schuyler, Virginia, are the largest in the world devoted exclusively to the production and fabrication of special purpose stone.

Section of Chemical Engineering Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y.

Virginia Alberene Stone Stair Treads and Platforms in Woodrow Wilson High School, Washington, D. C. Nathan C. Wyeth, Municipal Architect.

GENERAL CERAMICS COMPANY

Manufacturers of Acid-Proof Chemical Stoneware

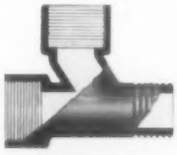
30 Rockefeller Plaza, New York, N. Y.

Buffalo Chicago Los Angeles San Francisco Tacoma Montreal

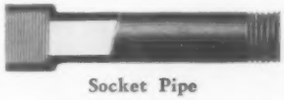
ACID-PROOF CHEMICAL STONEWARE LABORATORY EQUIPMENT

The Chemical Stoneware Division of General Ceramics Company makes a complete line of acid-proof chemical stoneware equipment for chemistry and physics laboratories in educational and research institutions, for general industrial chemical purposes, and for hospitals, electro-plating plants, newspapers, photo-engraving shops, and other establishments where corrosive fluids are used.

General Ceramics Chemical Stoneware Laboratory Equipment is widely used in educational institutions throughout the country. In fact, a list of the colleges and universities with chemistry laboratories equipped with General Ceramics Chemical Stoneware is practically a roster of our leading institutions of learning, including among many others Yale, Harvard, Vassar, Radcliffe, Duke, Pittsburgh, Wesleyan, Lehigh, Tulsa, Toledo, Berea, Purdue, Vanderbilt, McGill, California Institute of Technology, and the Universities of Maryland, Illinois, New Hampshire, Connecticut, Indiana, Pennsylvania, Ohio, Wisconsin, Nevada, California, and California at Los Angeles. General Ceramics equipment is used also in such buildings as the Walter Reed Hospital in Washington, the Curtis Publishing Company Building in Philadelphia, and in New York, the Times Building, Metropolitan Life Building, and United States Assay Office.



TY Fitting

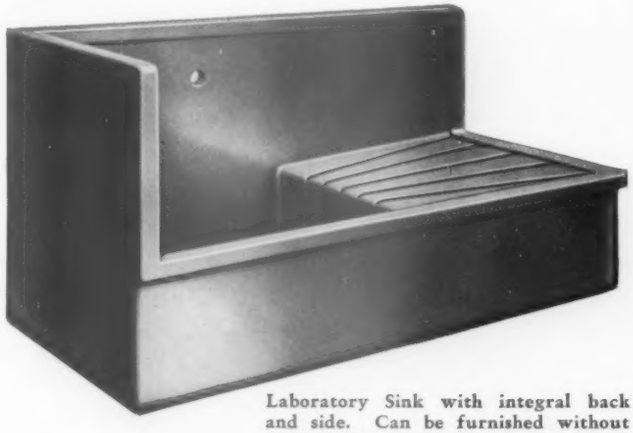


Socket Pipe

Quarter Bend

Description

General Ceramics Chemical Stoneware is a dense granite-like material with an attractive glazed surface. Both the glaze and the body of the ware are completely impervious to all acids and other chemicals, excepting hydrofluoric acid. The surface glaze is an integral part of the ware itself and therefore free from crazing and cracking. General Ceramics Ware is mechanically strong, leakproof, and easy to keep clean, and it cannot contaminate the chemicals handled. It lasts indefinitely and there is no upkeep or replacement expense.



Laboratory Sink with integral back and side. Can be furnished without back and side in various types and sizes

Laboratory Sink with double drainboard. Can be furnished also without the integral back, with single drainboard (either right or left), and with details of construction as required

The General Ceramics line of stoneware equipment includes laboratory sinks, drain lines and fittings, sumps, fume ducts, pumps, ventilating fans, and countless other items.

Engineering Service and Catalogues

Our Engineering Department will gladly assist in selecting the right stoneware equipment for any requirements. We cooperate in laying out laboratories and other buildings where corrosive products are handled, also in the design of special chemical apparatus. New bulletins on General Ceramics Laboratory Sinks and on Acid-Proof Pipe and Fittings will be furnished on request.

Specifications

Specifications should read as follows: "All parts of this installation subject to the action of acids or acid wastes are to be made of high-grade acid-proof chemical stoneware manufactured by the General Ceramics Company of New York."

MAURICE A. KNIGHT

Acid, Alkali and Corrosion Proof Chemical Stoneware

227 Kelly Avenue, Akron, Ohio

New York, N. Y.
Cleveland, Ohio
Niagara Falls, N. Y.

Chicago, Ill.
Detroit, Mich.
St. Louis, Mo.

Toronto, Can.
San Francisco, Cal.
Montreal, Can.

PRODUCTS

Acid Waste Pipe and Fittings
Acid-Proof Fume Ducts
One-Piece Laboratory Sinks
Acid-Proof Table Troughs
Neutralizing Sumps
Tanks, Jars, Filters, etc.

GUARANTEED SATISFACTORY — KNIGHT-WARE — "IT IS THE BODY ITSELF" — ACID-PROOF CHEMICAL STONEWARE

SOME INSTALLATIONS

Akron University
McGill University
Purdue University
Ohio State University
Brooklyn College
Wellesley College
Sarah Lawrence College
University of Arkansas
University of California
University of Washington
University of West Virginia
Mellon Institute of Industrial Research

KNIGHT-WARE

Knight-Ware is an improved ceramic material that is dense, tough and wholly inert to the action of chemical solutions or gases, weak or strong, hot or cold (Hydrofluoric acid and hot caustic solutions excepted). Its acid-proof quality does not depend upon any glaze or surface treatment. "It is the body itself" that is entirely acid-proof. Knight-Ware equipment, properly installed, is trouble-free and permanent.

LABORATORY SINKS

Knight-Ware sinks are custom-made to specified measurements without extra cost. The one-piece construction, smooth surfaces, rounded corners and acid-proof quality mean a freedom from leaks and a cleanliness that is permanent. Splash backs, drainboards, aprons and outlets of several styles may be had as integral parts of the sink. Bottoms are sloped to insure complete drainage. The finish is a rich brown salt glaze that will not stain or peel.

ACID WASTE PIPE AND FITTINGS

Knight-Ware pipe and fittings are made in standard designs in any bore from 1 to 60 inches and straight lengths up to 5 feet. Special pieces to fit unusual places or to eliminate extra joints are available at low cost. Knight-Ware pipe is light in weight, strong and acid-proof.

Joints, packed and poured to our specifications, are tight and lasting.

PressureFlex, our new type rubber joint, provides a positive seal with a minimum of time and labor.

KNIGHT-WARE FUME DUCTS

Ventilating pipe is available in round or rectangular shapes in bores up to 60 inches and with bell and spigot, flanged or plain butt end connections. Specify Knight-Ware for lasting protection.

SERVICE

If you are planning a new laboratory or modernizing your present one, we offer our knowledge and practical experience gained from scores of Knight-Ware installations.

Our fully illustrated Laboratory Equipment catalog will be sent upon request.

Fig 237 RD Sink with right hand drainboard. Available with left hand or double drainboards and apron.

275A Table Trough

268 Knight-Ware S-Trap with Cleanout

PACIFIC FOUNDRY COMPANY LTD.

551 Fifth Ave.
New York

3100 Nineteenth St., San Francisco

1400 So. Alameda St.
Los Angeles

(AGENTS IN PRINCIPAL CITIES)

YOUR LABORATORY PLUMBING AND VENTILATING
COMPLETELY NON-CORROSIVE
For All Acids* and Fumes

What CORROSIRON is:

An iron alloy, having a silicon content in excess of 14.25%, manufactured only by Pacific Foundry Company. A homogeneous alloy requiring neither treatment nor surface coating.

Chemical Properties

CORROSIRON shows zero rate of corrosion when suspended in nitric acid or in nitrous fumes (two of most powerful corrosive agents known). Infinitesimal corrosion rates with all other acids* shown by tests by government and private agencies. Confirming, detailed data available on request.

University of Minnesota
Forestry Building

U. S. Mint
San Francisco, Calif.

University of Georgia
School of Medicine

U. S. Assay Office
New York City

years. For more than a quarter century, Pacific Foundry Company has been building a reputation for quality rather than for quantity of the specialties which it manufactures. Full details of acceptance by Federal, State and school authorities on request.

Write for Folder

CORROSIRON will save you money on silicon iron installations. Write or wire for bulletins giving roughing-in dimensions, complete chemical and physical properties and list of installations in your vicinity.

Where Used

In high school, university, hospital and industrial laboratories for plumbing and fume exhaust systems in practically every State in the Union.

Physical Form

CORROSIRON drain pipe and fittings (E. H. Std.) in all sizes; fans and Kjeldahl Fume Tubes immediately available from convenient stocks.

Reputation

CORROSIRON, one of the first high silicon irons, has been manufactured and in satisfactory service for over 20

SPECIFICATIONS

All acid proof drain pipe and fittings shall be ferro-silicon—CORROSIRON—or equal to comply with the following analysis:

All acid waste and acid vent piping shall be of approved high silicon cast iron bell and spigot type and shall contain:

"Not less than 14.25% and not more than 15% silicon.
Manganese below .50%.
Total carbon content below 1.12% and above .50%.
Sulphur below .05%.

"High silicon cast iron pipe and fittings for acid waste and acid vent pipe shall be of the thickness, etc., corresponding to extra heavy soil pipe and fittings unless otherwise approved."

* Except hydrofluoric.

CORROSIRON

MADE IN U.S.A.

HIGH SILICON ACID RESISTING IRON

THE AMERICAN SCHOOL AND UNIVERSITY

THE UNITED STATES STONEWARE CO.

Works (Since 1865): Akron, Ohio — NEW YORK OFFICE: 60 East 42nd Street

LOS ANGELES: Hollingsworth Building — CHICAGO: 20 N. Wacker Drive — SAN FRANCISCO: 116 New Montgomery Street

Acid-proof Chemical Stoneware Laboratory Sinks

"U. S. **Standard"** Acid-proof Sinks are widely used in laboratories of universities, schools, hospitals and industrial companies.

The construction is **one-piece,** without seams or joints. The material is non-porous and non-absorbent. The corners are well-rounded and the surface smooth. Special sizes can be made to fit any desired space.

Glaze—Our exclusive "Hy-Gloss" salt glaze has a high lustre, dark brown finish and is an integral part of the body itself.

Guarantee—Our products are unconditionally guaranteed to be acid, alkali and corrosion proof throughout the body, with or without the salt glaze.

Bulletin—Write for Bulletin No. 504 giving full information.

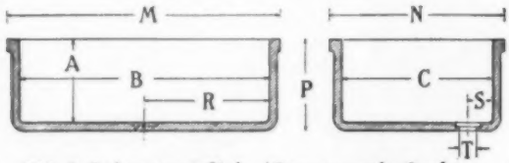


Fig. 112-A Laboratory Sink (Countersunk Outlet to take Metal Plug).

Fig. 112-ASP, Ditto, but with Integral High-Back.

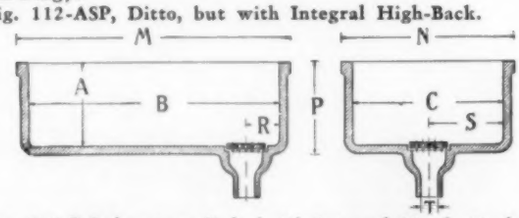


Fig. 112-B Laboratory Sink (with Integral Nipple Outlet and Removable Strainer).

Fig. 112-BSP, Ditto, but with Integral High-Back.

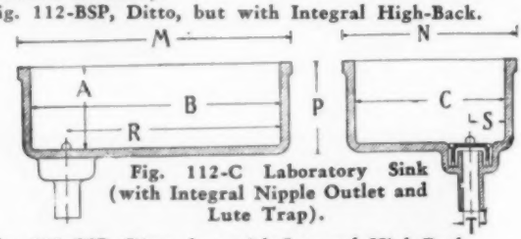


Fig. 112-C Laboratory Sink (with Integral Nipple Outlet and Lute Trap).

Fig. 112-CSP, Ditto, but with Integral High-Back.

DIMENSIONS OF "U. S. STANDARD" ACID-PROOF SINKS

Size No.	B	C	A	M	N	P	Code Word
700	11	9	8	14	12	9	Tab
701	14	10	6	17	13	7	Tacit
702	16	8	6	19	11	7	Tack
703	15	14	6	18	17	7	Taffy
704	16	12	6	19	15	7	Tag
705	16	16	9	19	19	10	Tale
706	18	10	11	21	13	12	Talon
707	18	14	7	21	17	8	Tamp
708	18	14	10 ½	21	17	11 ½	Tang
709	18	16	6	21	19	7	Tape
710	20	12	7	23	15	8	Tally
711	20	12	12	23	15	13	Tar
712	20	16	7	23 ½	19 ½	8 ¼	Taunt
713	24	15	8	27 ½	18 ½	9 ¼	Tenor
714	32	16	7	35 ½	19 ½	8 ¼	Terse
715	30	20	8	33 ½	23 ½	9 ¼	Thumb
716	36	18	7	39 ½	21 ½	8 ½	Tiger
717	42	20	12	45 ½	23 ½	13 ¾	Toast

Integral Backs on No. 700 to No. 709 sinks are 8 in. high and are 10 in. high on the larger sizes.

Special sizes can be made to order.

Other Products—Laboratory Table Troughs, Hemispherical Sinks, Sumps or Dilution Basins, Kjeldahl Equipment, Gas Generators, Laboratory Chlorine Cells, Suction Filters, Acid-proof Jars and Tanks, Burner Guards, Laboratory Jar Mills, Funnels, Exhaust Fans, etc.

TRADE-MARK

Acid-proof Chemical Stoneware Piping

Patented "FLEXLOCK" Rubber Joints make a perfect and economical joint between two pieces of Chemical Stoneware Pipe. Equally satisfactory for vertical and horizontal drainage and fume duct lines.

"FLEXLOCK" Joints are the ONLY joints insuring all these advantages: **Positive seal**—No joint leaks. **Flexibility**—Takes care of expansion and building vibration. **Installation ease**—No other joints can be made so quickly. **Permanence**—No joint replacements. **Low installation cost**—Cheaper per laid foot than poured joints. **Unaffected by any fluid.** Even handles solvent hydrocarbons.

There is no other commercial product which is more universally resistant to acids, alkalis and corrosive chemicals and gases. Bromine, ferric chloride, sulphuric, sulphurous, nitric and hydrochloric acids of any concentration can all be handled with perfect safety.

The hubs are 4-in. deep and both the spigot and hub ends are deeply corrugated. Standard pipe lengths are 60 in. and are guaranteed straight and accurate.

Our line is complete, including elbows, bends, Y's, TY's, traps, crosses, sumps, floor drains, etc.

Cross-Section of "FLEXLOCK" Rubber Joint for Bell-and-Spigot Pipe

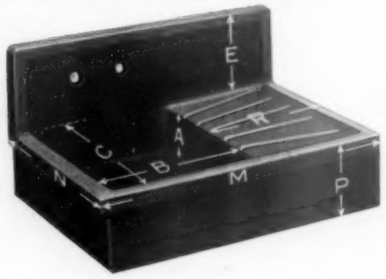
ACID-PROOF SINKS WITH INTEGRAL DRAINBOARDS

(One-piece)

Fig. 533-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 533-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 533-CSP (with Integral Nipple Outlet and Built-in Lute Trap).



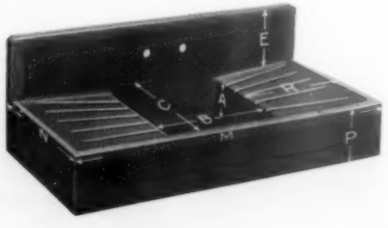
Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word
307	18	14	7	8	37 ½	16 ½	8 ⅞	18	197	Tong
312	20	16	7	10	39 ¾	19	9 ⅛	18	285	Tope
313-A	24	18	8	10	43 ¾	21	10 ⅛	18	348	Tory
315	30	20	8	10	49 ¾	23	10 ⅛	18	410	Tuch

Sinks are made with drainboards at right hand or left hand. Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral backs and sinks without integral backs can also be supplied.

Fig. 536-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 536-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 536-CSP (with Integral Nipple Outlet and Built-in Lute Trap).



Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word
507	18	14	7	8	54	16 ½	8 ⅞	18	284	Trew
512	20	16	7	10	56	19	9 ⅛	18	402	Trig
513-A	24	18	8	10	60	21	10 ⅛	18	477	Trow
515	30	20	8	10	66	23	10 ⅛	18	546	Tude

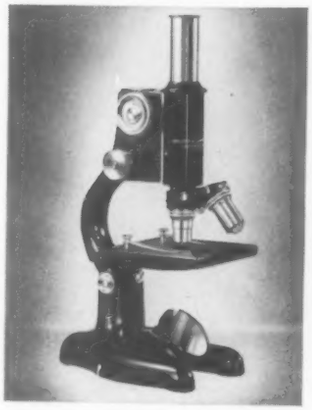
Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral backs and sinks without integral backs can also be supplied.

BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt A/M, Germany

FB MICROSCOPE



Microscope FB is especially designed and built for elementary science work and its price, based on quantity production, is in line with the most restricted budget. It is ruggedly built to stand many years of hard class room usage. Its optics are of the same precision type that characterize the more expensive research type of instrument. Features include standard size, coarse and fine adjustments, double revolving nose piece, standard objectives and eyepieces, disc diaphragm, solid Bakelite stage, concave mirror, etc. Velvety black, wear resisting finish—Chromium plated parts.

Microscope F is similar to the instrument above but fine adjustment has been eliminated in the interests of economy. Magnifications range from 20 to 310 diameters.

HRE-8 MICROSCOPE

This splendidly designed and sturdily built microscope is especially adapted for advanced work in universities. Has vertical binocular body tube (interchangeable with monocular tube for photomicrography). The large stage (115 mm x 130 mm) is plain although any type of stage can readily be attached. The Abbe type condenser, 1.20 N.A., is in rack and pinion sub-stage. Huygenian type eyepieces and Achromatic objectives are of the finest grade optically. Oil immersion objective included. Other eyepieces and objectives for various purposes are available. Inclined binocular body tube is recommended for greatest comfort in extended observations.

K TYPE BINOCULAR MICROSCOPE

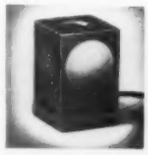
The great popularity of the K Type Binocular Microscope has prompted us to offer the Model "K," for schools and universities. Its range of magnifications of from 7X to 150X especially suit it for biological, bacteriological and paleontological work. An interesting feature of this series is the new dustproof Shuttle nosepiece, specially made for this series. This microscope gives stereoscopic, three dimensional effect. Image is upright and unreversed. Exceptionally wide field.

MICROSCOPE TABLE LAMP

This Table Lamp can be used to illuminate several microscopes at once. It is invaluable in class room work where groups of students are making observations at the same time.

Equipped with daylight blue globe, this lamp represents the finest source of artificial daylight for the microscope, approximating noon sun light.

OTHER MICROSCOPE LAMPS



Other B & L Microscope Lamps are available for various purposes in the school laboratory. The two shown herewith are (right) a substage lamp and (left) the Universal Microscope Lamp.

B & L MICROTOMES

The B & L line of Microtomes is most complete. The Minot Automatic Rotary Microtome illustrated is ideal for rapid serial sectioning, cutting section with accuracy down to 1 micron in thickness. Feeding mechanism operates automatically. Dustproof operating mechanism. Catalog D-21 describes the complete line, including the new Precision Automatic Microtome—motor driven.

B & L SPECTROGRAPHS

The complete B & L line of Spectrographic Equipment covers every need. Models range from the Bunsen Spectroscope for elementary class room work to the large Littrow Spectrograph for examining complex alloys. Each is designed and built with the utmost care and due to our great experience in this field represents all of the best features necessary for both teaching and laboratory research. Catalogs D-221 and D-20 give complete details.

QR MAGNIFIER

This is an adjustable tripod type magnifier which is placed directly over the specimen. Has double lens, magnifying 7.5X. Useful for the school laboratory. Other magnifiers for various purposes are available.

SEND FOR CATALOGS

For complete information on Laboratory Microscopes send for Catalog D-185. For information on B & L Balopticons see page 325 this catalog. Remember the instruments listed on these pages are but a small part of the B & L Line. If you have need for information on any optical products whatsoever, Bausch & Lomb will gladly be of service to you.

SPENCER LENS COMPANY

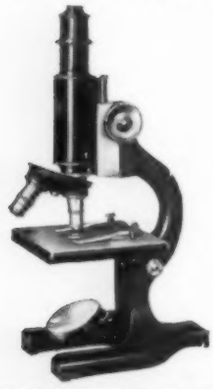
Buffalo, New York

Manufacturers of

Microscopes—Microtomes—Optical Measuring Instruments
Delineascopes—Photomicrographic Cameras

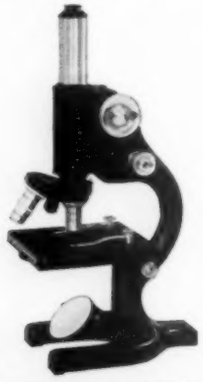
BRANCH OFFICES

New York . . . Chicago . . . Washington . . . Boston. . . San Francisco . . . Los Angeles . . . Dallas . . . Columbus



STUDENT MICROSCOPE No. 74

A low cost, standard size, quality instrument for classroom work requiring magnifications up to 360 diameters. Equipped with coarse adjustment only. Solid bakelite stage, 110 mm. x 105 mm., will not warp and is resistant to all ordinary laboratory reagents. Revolving disc diaphragm is easily rotated at edge of stage. Concave, adjustable mirror of standard diameter, is mounted in an adjustable fork. Substage condenser cannot be supplied with this instrument.

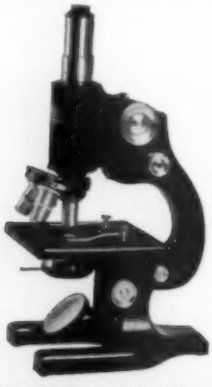


ELEMENTARY LABORATORY MICROSCOPE No. 66

This standard size microscope for biological laboratory work has the same high quality optics and mechanical parts found on the more expensive instruments. Equipped with coarse and fine adjustment. Substage condenser cannot be supplied with this instrument. Durable, bakelite stage 110 mm. x 105 mm. Sturdy, revolving disc type diaphragm under the stage is easily manipulated at edge of stage.

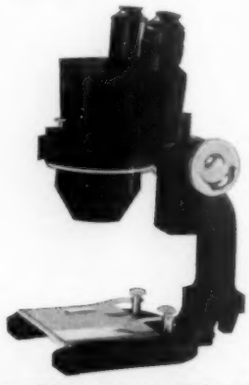
ROUTINE LABORATORY MICROSCOPE No. 63

This microscope meets the most rigid specifications for a sturdy, durable and precision laboratory instrument. Designed to accommodate a substage condenser for greater magnifications. Highest quality optical system. Has both coarse and fine adjustment. Durable bakelite stage 125 mm. square. An iris diaphragm, located under the stage, insures satisfactory modification of illumination for low power work.



ADVANCED LABORATORY MICROSCOPE No. 33H

Designed for almost any type of microscopic observation because it permits the use of all standard Spencer microscope accessories. Has the following exclusive Spencer optical and mechanical features: (1) Balanced Optical System, (2) Dual-Cone Nosepiece, (3) Fork-Type rack and pinion Substage, (4) Rhodium Plated Parts. Has micrometer type fine adjustment. It is the microscope generally selected for medical work. Mechanical stage on No. 33MH has a range sufficient to cover 3″ x 2″ microscope slide.



JUNIOR BINOCULAR MICROSCOPE No. 57A

This instrument meets the demand for a low cost, low power binocular microscope for general classroom use. The stereoscopic and erected image aids inspection and analysis of the object. The paired objectives are of the same optical quality as those used on higher priced instruments and may be furnished in a special, dustproof revolving nosepiece. Supplied at slightly higher cost with base, mirror and inclination joint.

STANDARD BINOCULAR MICROSCOPE No. 55

For most exacting laboratory and classroom work this large and sturdy low power binocular microscope provides for magnifications from 3.6 to 210. Has a large 100 mm. square stage. Accommodates large dishes and specimens. The 16° convergence of the objectives increases the depth of focus. Number 56 is identical to number 55 except that it is not equipped with the base, mirror and inclination joint shown in the illustration. Both instruments are available with vertical or inclined binocular bodies.

THERE IS A SPENCER MICROSCOPE FOR EVERY PURPOSE. WRITE DEPT P13 FOR COMPLETE DETAILS

THE EATON-DIKEMAN COMPANY

Manufacturers of Filter Papers

Mount Holly Springs, Penna.

LABORATORY FILTER PAPER FOR SCHOOLS, COLLEGES AND INDUSTRIES

FOR USE IN HEAVY AND LIGHT FUNNEL WORK, FILTER PRESSES AND FILTER MACHINES

Made with pure spring water

The Eaton-Dikeman Company was established in 1893 and is today the world's largest manufacturer of qualitative and industrial filter papers.

Forty diversified grades of uniform quality are made under strict laboratory control in a mountainous locality free from industrial aerial pollution.

Each grade was created to meet exact requirements of the liquid to be filtered.

The high standard quality of the E&D filter papers is acquired by the use of the best obtainable raw materials, from which our filter papers are made, under the careful supervision of laboratory experts. Analysis of the spring water used in making our filter papers shows it to be nearly as pure as distilled water. This assures you that the E&D filter papers are free from chemicals and salts that would be injurious to the filtered products.

ASK FOR THE E&D LABELS

Eaton-Dikeman Laboratory Papers are sold by all laboratory supply dealers under their own special labels as well as under the E&D labels. To be sure of getting E&D quality it is best to ask for the E&D label.

Some of the liquids filtered with E&D products are mineral and vegetable oils, varnishes, paints, all alcoholic and non-alcoholic beverages, sugar, perfumes, extracts, drugs, chemicals, soaps, glue, ink, fruit juices.

E&D Folder Filter Papers with uniformity and purity plus precision and speed. Two grades stocked in all standard sizes 12½ cm to 60 cm. No. 192 rapid yet retentive, No. 193 medium fast, very retentive. Exceptionally strong and will retain the fold while in the funnel. With the full rounded apex permits an even distribution of the load preventing breakage at the apex.

The folded papers can be supplied in twelve different grades to meet the requirements in the industrial as well as the laboratory field.

Packed 100 in a box. Samples sent upon request.

Filter Paper Clippings free from dust and grease are recommended to manufacturers of pharmaceutical, biological products in filtering machines, etc.

E&D Bibulous Paper with good absorbent quality recommended for drying bacteriological slides, etc., supplied in sheets any size or books of fifty sheets 4″ x 6″ with advertising matter on covers.

E&D Lining Paper, white or granite color, prevents glassware breakage and absorbs spilled liquids when placed in drawers and on shelves.

E&D Qualitative Filter Papers in all sizes up to 20″ diameter packed 100 circles in a box.

PHYSICAL CHARACTERISTICS OF MOST POPULAR LABORATORY GRADES

Grade	Color	Surface	Texture	Rapidity cc. per Min.
607	White	Smooth	Med. Close	35-50
609	White	Smooth	Med. Close	30-45
612	White	Embossed	Med. Close	20-35
613	White	Smooth	Very close	15-35
615	White	Creeped	Fairly Open	75-150
617	White	Creeped	Open	150-250
619	Gray	Creeped	Fairly Open	75-150
620	Gray	Embossed	Fairly Close	45-70
629	White	Smooth	Med. Close	50-75

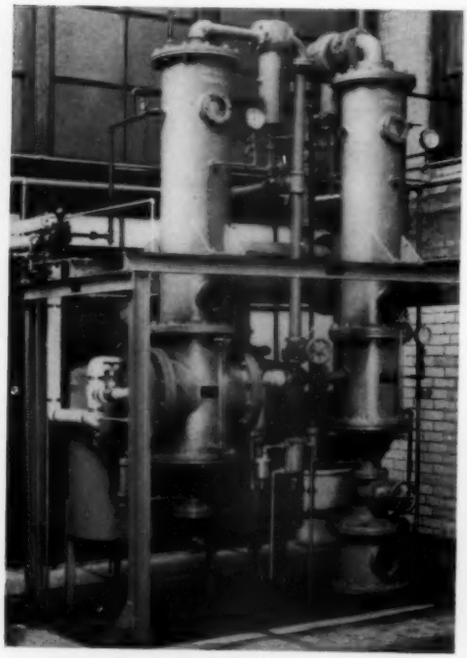
Note: Rapidity is number of cubic centimeters of distilled water filtered per minute in a 4″ 60° funnel.

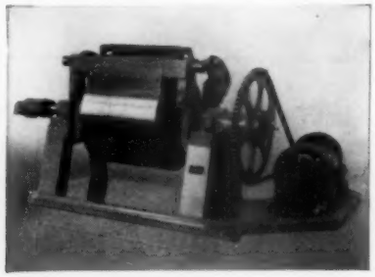
F. J. STOKES MACHINE COMPANY

5960 Tabor Road (Olney P. O.), Philadelphia, Pa.

Representatives in New York, Chicago, Cincinnati, St. Louis Pacific Coast Representative — L. H. Butcher Company, Inc.

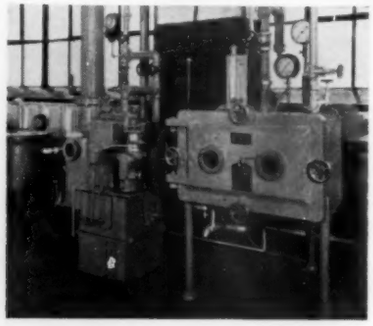
Double-effect evaporator as installed in the laboratory of the University of Pennsylvania. Arranged so that either effect can be operated independently. Second effect arranged for crystallizing



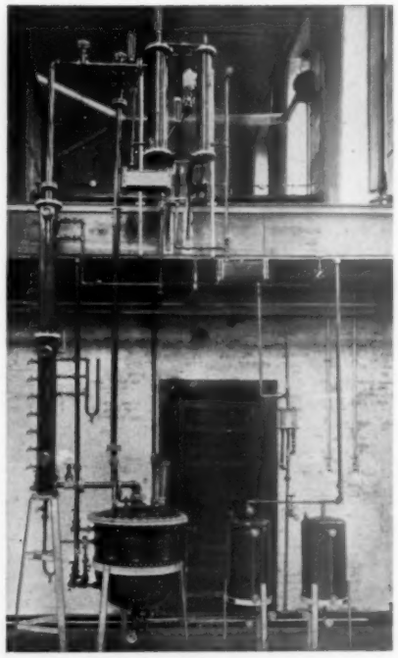


Above: Laboratory Size Atmospheric Drum Dryer, stainless steel drum

Below: Complete Laboratory Installation of Vacuum Shelf Dryer with Surface Condenser and High Vacuum Pump



Fractional Distilling Apparatus specially designed so that all engineering data can be obtained—as installed at several universities



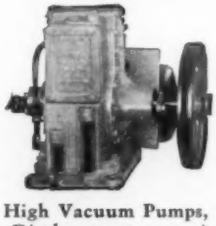
STOKES *Special* EQUIPMENT *for Teaching and Research Activities*

We have had the privilege of working with the directors of the Frick Laboratory at Princeton, the chemical engineering laboratories at the Universities of Columbia, Pennsylvania, Tulane, Florida, Penn State College, University of Shanghai and others, both here and abroad. We have engineered and manufactured equipment in great variety and large volume, for both laboratory and commercial services for more than 40 years.

This broad experience enables our engineers to cooperate with you in a most practical way in designing and building the type of apparatus you require, apparatus so designed that data may be obtained for the demonstration of basic principles in teaching or research activities.

Consult with us about equipment needed to develop or expand your facilities . . . Vacuum Dryers, Vacuum Evaporators, Distilling or other special apparatus and for standard Water Stills, Dryers, High Vacuum Pumps, etc. We know how to build equipment economically to best meet special requirements . . . will make specific suggestions and recommendations, if you will state your problems.

Stokes Water Stills are made in 22 stock models, capacities ½ to 100 gals. per hour. Widely used for the economical production of distilled water of exceptionally high chemical and bacteriological purity



Stokes High Vacuum Pumps, 10 cu. ft. to 225 cu. ft. Displacement, are simple, rugged and compact. Produce and maintain vacuum within a few microns of absolute. Three moving parts only. Oil-sealed, rotary type. Good for years of dependable service with little or no maintenance cost

F.J.Stokes **PROCESSING EQUIPMENT** FJS Est. 1895

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES IN PRINCIPAL CITIES

ELECTRIC LABORATORY APPARATUS AND EDUCATIONAL SERVICE for COLLEGES AND TECHNICAL SCHOOLS

Motors
Generators
Switchboards
Converters

Control Panels
Relay Demonstration Panels
Transformers
Electrical Measuring Instruments

Recognizing the fact that the future welfare of industry, and of this country, depends upon how well the students of today are trained for the work of tomorrow, the General Electric Company endeavors to aid the faculty and students of our schools and colleges in every way possible. To this end, publications, technical information, motion-picture films, illustrated lectures, etc., are made generally available without charge. Further than this, liberal discounts are allowed to educational institutions.

For use in school laboratories the General Electric Company has given special attention to the design and manufacture of various instruments, machines and devices that embody the characteristics of the corresponding commercial types, but in smaller sizes and ratings, at less expense.

General Electric engineers will be glad to recommend apparatus to meet your special conditions if you will give them details such as the type of course, number of students, laboratory or shop space available, etc.

ELECTRIC MEASURING INSTRUMENTS

No apparatus in the college laboratory is of more importance than the electric measuring instruments. A well-equipped laboratory will need an assortment of standard instruments of all types and capacities, since there is hardly an experiment performed by the students which does not require their use.

The satisfaction and benefit derived from these laboratory experiments depend to a very large degree upon the **accuracy** of the instruments. There is nothing more discouraging to the student than to find that his results do not check. For this reason, when selecting laboratory instruments, too much care cannot be given to accuracy, permanence of calibration, dead-beat indications, and legibility of scales. Of course, local disturbances should not influence readings and, in many cases, low internal losses are important. If, added to these features, instruments of structural simplicity and fine appearance can be procured, one important problem facing the laboratory director will have been solved.

In the design and construction of G-E electric measuring instruments, careful consideration is given to all these details. The instruments described on the following pages have been selected from a wide range of the Company's products as being most suited to school laboratory use.

General Electric, aware that electric laboratory instruments are subjected to extremely rough usage in the hands of inexperienced students, offers a prompt and complete repair and recalibration service to college and technical schools at cost.

PORTABLE INSTRUMENTS

Type P-3
Alternating Current

Type P-3 instruments are designed and built to give long, dependable service at high accuracy. They comprise a full line of ammeters, voltmeters, single-phase and polyphase wattmeters, frequency meters, power-factor meters, and a single-phase wattmeter for low-power-factor measurements—each of the above covering the usual ranges of current, voltage, frequency, etc. The instruments excel in mechanical construction, are neat in appearance, and very substantial. They are enclosed in neat walnut carrying cases, approximately 5½ by 8½ by 8¼ inches, with removable hinged covers, snap locks and leather handles.

Accuracy: The P-3 instruments, with the exception of polyphase wattmeters, are correct to within 0.2 per cent of full-scale values on direct currents, and on alternating currents of any frequency up to 133 cycles per second, if the scale corrections are applied. The accuracy variation of the polyphase wattmeter is 0.5 per cent.

VARIATION PER DEGREE C. AMBIENT RISE

Wattmeters	Per cent
50/100 volts	0.003/0.009
100/200 volts	0.008/0.009
200/400 volts	0.010/0.012
Ammeters	
5/10 amperes	0.016
Voltmeters	
75/100 volts	0.002/0.006
150/300 volts	0.006/0.010
300/600 volts	0.005/0.006

Scales: Scales subtend an arc of approximately 90 degrees and are approximately 6½ inches long. They are very legible. Attached to inside of cover of each instrument case is a calibration certificate.

PORTABLE INSTRUMENTS—cont.

Type DP-2
Direct Current

Type DP-2 instruments comprise a complete line of high-grade direct-current instruments obtainable in the same classifications as the alternating type, as mentioned on the preceding page. All DP-2 instruments utilize the well-known d'Arsonval element. They are built complete in a polished walnut case with hinged cover, snap catch and leather handle, 8 by 8 by 4½ inches overall.

High Accuracy

Type AP-9 Voltmeter

Types AP-9 and DP-9
Medium Size
For Alternating and Direct Current

Types AP-9 and DP-9 instruments are of medium size, for general laboratory and testing work. They are available as ammeters, voltmeters and single-phase wattmeters in a wide range of ratings. The case is of attractive, durable molded Textolite, and the long scale (41″) is equipped with a mirror which, in conjunction with the knife-edge pointer, practically eliminates errors due to parallax. The accuracies of the Types AP-9 and the DP-9 are within ¾ of 1 per cent, and ½ of 1 per cent of full scale value, respectively. An external zero adjuster is provided on the outside of the case. **For further information, ask for GEA-1784.**

Combination volt-wattmeters are also available. One is rated 150 volts, 500 watts, and has a convenient plug and socket connector to adapt it for testing home appliances. Other ratings are also available.

Types AS-5 and DS-5

Types AS-5 and DS-5 are also well adapted for work in freshman or sophomore laboratories or shops of vocational or technical high schools. The molded-compound case is $5^{15}/_{32}$ by $3^{7}/_{16}$ by $1^{31}/_{32}$ inches. The scale length is approximately 3 inches, and the accuracy is within 1 per cent of full-scale value. All instruments are equipped with zero-adjusting devices with readily accessible operating screw projecting through the case.

Both the AS-5 and the DS-5 types are made with the multiple rating, or double scale, and with but one pair of terminals. The transfer from one scale to the other is accomplished by means of a cylindrical switch located between the two binding posts. **Type DS-6** instruments are also available, constructed with a d'Arsonval movement and a copper-oxide rectifier for use on both alternating and direct current. **For complete details, ask for GEA-305.**

Type AS-5 Voltmeter

Portable Stand for 3½-Inch Instruments

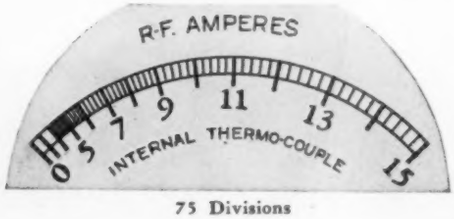
SMALL PANEL INSTRUMENTS

Alternating and Direct Current

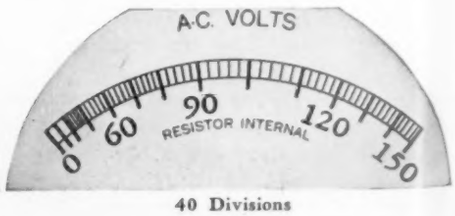
This line of instruments includes voltmeters, ammeters, milliammeters and microammeters **(Types AO and DO).** Accuracy is within 2 per cent of full-scale value. Cases are of durable molded Textolite. Applications include welding sets, battery-charging panels, radio test sets, etc. Type AO-21 or DO-40 is supplied with a universal-type case, for flush or surface-mounting. Type AO-22 or DO-41 has a wide flange for flush mounting; diameter over flange, 3½ inches. **Ask for GEA-1239B.**

TYPICAL SMALL PANEL INSTRUMENT SCALES

60 Divisions



75 Divisions



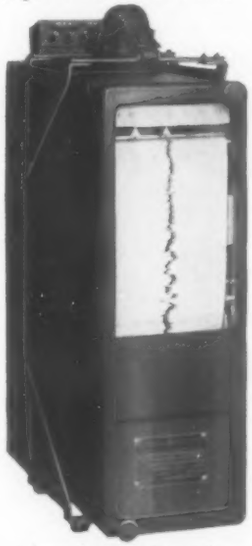
40 Divisions

SWITCHBOARD INSTRUMENTS

Rectangular Type
For Alternating and Direct Current

G-E rectangular-type switchboard instruments include voltmeters, ammeters, wattmeters, power-factor meters, and frequency meters, for alternating current **(Type AD-6)**; and voltmeters and ammeters for direct current **(Type DD-6)**. These instruments are of the highest quality; the accuracy of the voltmeters, ammeters and wattmeters is within 1 per cent of full scale.

Rectangular



Photoelectric Recorder

Other features include: dull-black finish metal case, antiparallax scale and pointer, antiglare glass; long, clearly marked scales (5.1″); magnetic damping, high torque, and attractive appearance. **For complete description, ask for GEA-1758.**

PHOTOELECTRIC RECORDERS

The photoelectric recorder possesses all of the desirable characteristics of direct-acting recorders, and at the same time is capable of a sensitivity and a rapidity of response equal to the highest-sensitivity indicating instruments. In general, anything which can be indicated can be continuously recorded by means of the photoelectric recorder.

The usefulness of this instrument has been clearly demonstrated; the results in many cases being of such a nature that they could not have been obtained by any other known method.

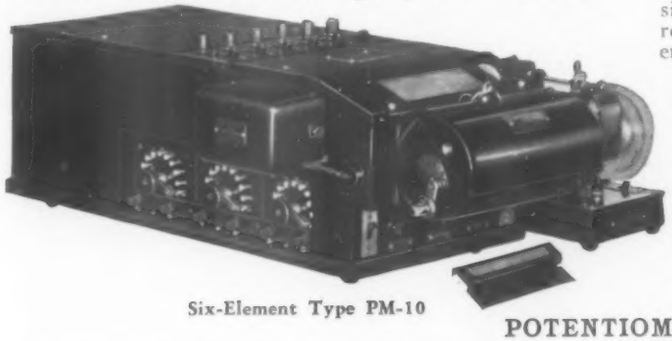
The instrument is completely self-contained, requiring only an auxiliary source of 115 volts, 25, 50, or 60 cycles, depending upon the frequency desired. It is available for either portable or switchboard use.

The internal parts of the photoelectric recorder may be grouped into five units; namely, the basic indicating instrument or galvanometer, optical system, recording element, chart carriage, and power unit.

PERMANENT MAGNET OSCILLOGRAPHS

The six-element, general-purpose oscillograph, Type PM-10, is designed for convenience in operation under all test conditions. It is furnished with six galvanometers for current or potential measurements, and a timing vibrator provides a seventh record when it is desired. Watt galvanometers, interchangeable with potential galvanometers, are available.

This oscillograph is suitable for use in the laboratory or in the field. It produces records 3⅝″ or 6″ wide, either in a magazine film holder giving 3 or 5 exposures on a roll film, or in continuous-drive film holder giving continuous records up to 20 feet in length. A continuous-drive record paper holder is available, which gives records up to 100 feet in length.



Six-Element Type PM-10

The Portable two-element oscillograph, Type PM-12, is entirely self-contained. This instrument meets the needs of schools and colleges where it is desired to show two simultaneous records on a viewing screen. It also provides means of making inexpensive oscillograms of recurrent phenomena.

A magazine film holder is included with this instrument. A continous-drive film holder for use in recording transient phenomena can also be furnished.

Two-Element Portable

POTENTIOMETERS

Extreme accuracy in the measurement of small potentials is obtained by using a **precision potentiometer.** This is accomplished without drawing any current from the source to be measured. This potentiometer will measure voltages down to one microvolt.

The **deflection potentiometer** is especially useful in measuring both voltage and current with a high degree of accuracy. This potentiometer can be operated more rapidly than the precision type.

The **thermocouple potentiometer** is used to measure the **emf** of thermocouples. This does not draw any current from the thermocouples and therefore is the most accurate means of measuring a thermocouple output.

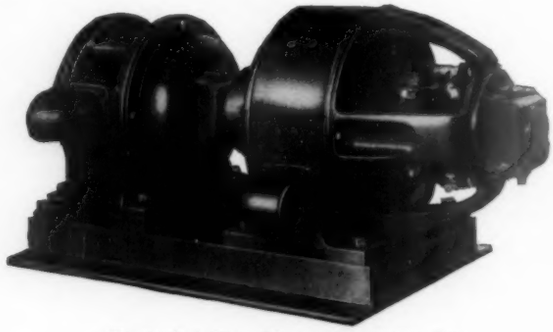
Precision Potentiometer

ELECTRON TUBES

The importance of electron tubes nowadays needs hardly be mentioned to the technical educator. It may be said that electron tubes are revolutionizing the electrical industry. All types of electron tubes are available.

ALTERNATING-CURRENT GENERATOR AND MOTOR

AHI Synchronous Generator, 6 Pole — 5 Kva (4 Kw., 8 Pf.) — 110/220 V., 1, 3 or 6 Phase— 1200 R.p.m.



Typical 5 Kw. Motor Generator Set

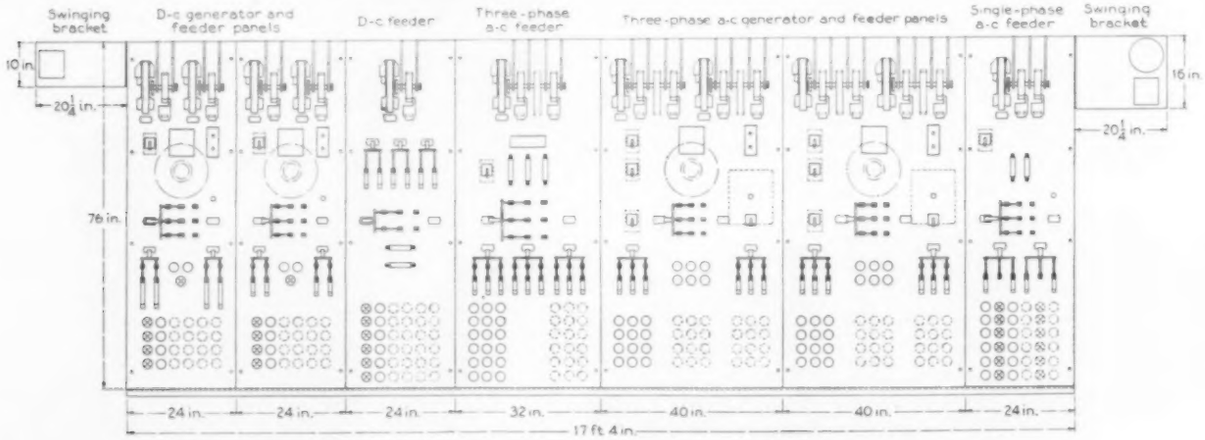
Type AHI alternating-current generator, illustrated, has long been the standard for teaching the fundamentals of alternating currents. Its flexibility permits its use in a very wide variety of laboratory experiments. It is now manufactured in two ratings which conform closely to standard commercial machines, but modifications make it ideal as a school demonstrating unit.

Type AHI is designed to run as an alternator or synchronous motor. Extra rotors are available which, when substituted in place of the salient pole rotor, convert the machine into a squirrel-cage induction motor, a phase-wound-rotor induction motor or frequency converter.

A phase displacement set and a phase displacement dynamometer set have been developed around the rating illustrated. These two unit sets are designed specially for laboratory use.

LABORATORY SWITCHBOARD

General Electric has developed a switchboard to meet the needs of the technical school laboratory which provides maximum flexibility. This board provides for parallel operation of a-c and d-c generators, under standard conditions, and it supplies the laboratory with a very effective and variable feeder system. A great asset to this feeder system is the plug switch also here illustrated, used extensively throughout the board. This facilitates making and changing connections and saves times and trouble in shifting power to circuits where needed.



The holes shown dotted are for CR 1939 receptacles to be purchased separately, mounted by the purchaser, and connected to the auxiliary plug-switch panels. Holes not placed in service may be buttoned

Bulletin GEA-1185, illustrating and describing G-E apparatus particularly adapted to school and college laboratory use, is available on request. Also booklets on construction projects as follows:

GES-909: Construction Data, ¼-hp. Single-phase Induction Motor
GEA-2138: Construction Data, ¾-hp. Three-phase Induction Motor
GEA-2140: Construction Data, ½-hp. Single-phase Induction Motor
GEA-2289: Construction Data, 250-watt 125-volt d-c Generator
GET-569: Construction Data, Transformer Rated Natural Draft, 60-cycles, 1½-kv-a; Primary Volts, 220; Secondary Volts 55/110

Kits for these projects can be purchased from the General Electric Company.

Complete information can be obtained from our nearest sales office.

Laboratory Plug Switch, CR-1939

GENERAL RADIO COMPANY

30 State Street, Cambridge, Massachusetts

BRANCHES

New York — Los Angeles

IF YOU make **any** kind of electrical measurements in your laboratory you'll find a suitable G-R instrument or part backed up by over twenty-three years of experience in pioneering high-quality laboratory apparatus.

General Radio apparatus and accessories are used in the leading educational, governmental and industrial laboratories throughout the world. General Radio products are noted for the care taken to insure ahead-of-the-times design, correct engineering, careful manufacture and rigid inspection.

Here is a partial list of G-R instruments, all of which you should know more about:

BRIDGES—general-purpose, direct-reading Schering, radio-frequency, inductance, megohm meter, skeleton universal, vacuum-tube.

LABORATORY STANDARDS—both fixed and variable standards of capacitance, inductance and resistance in a wide range of sizes and ratings.

OSCILLATORS—a-c and battery-operated beat-frequency, tuned circuit and electro-mechanical.

AMPLIFIERS—a-c and d-c operated with high gain, wide frequency range and flat frequency characteristics.

WAVEFORM MEASUREMENTS — high-speed moving-film cameras, modulation and distortion meters, wave analyzers and filters.

FREQUENCY MEASUREMENTS — standard-frequency assemblies, interpolation and auxiliary equipment, secondary frequency standards, piezo-electric oscillators, multivibrators, frequency deviation meters, frequency limit monitors, heterodyne frequency meters, quartz plates, precision tuning forks, electronic audio-frequency meters, precision and general-purpose wave-meters, synchronous clocks.

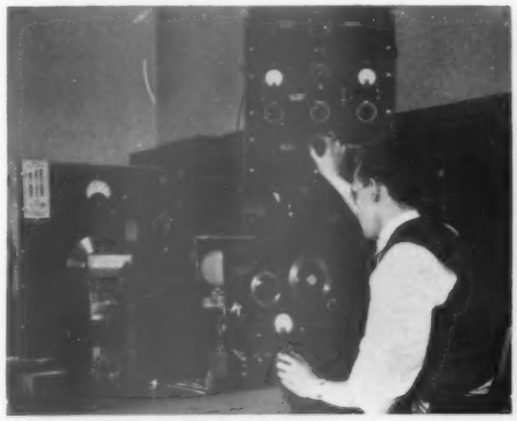
INDUSTRIAL MEASUREMENTS — stroboscopes for motion observation and speed measurements, sound level meters, sound analyzers.

MANUAL VOLTAGE CONTROLS — eighteen models of the VARIAC continuously adjustable auto-transformer for all kinds of fine a-c voltage control.

STANDARDIZED PARTS—variable and fixed air condensers, plug-in coils, rheostats and potentiometers, oxide rectifiers and thermocouples, audio-frequency transformers, relay racks, dials, knobs, switches, binding posts, plugs and jacks.

Investigate the complete line of G-R apparatus

WRITE FOR CATALOG 340
for Complete Information



Communications

Chemical

Electrical

RAWSON ELECTRICAL INSTRUMENT CO.

INCORPORATED

101 Potter Street, Cambridge, Mass.

BRANCHES
New York City and Chicago

Specialists in High Sensitivity Meters — ***Special Apparatus Built to Order***

Types 501, 502, 504 and 520

TYPE 501 MICROAMMETERS, MILLIAMMETERS, MILLIVOLTMETERS, and VOLTMETERS

Single Ranges—
From 2 microamperes to 1 ampere, full scale.
From 1 millivolt to 1000 volts, full scale.

Multi-ranges—
From 4 microamperes to 1 ampere, full scale.
From 2 millivolts to 1000 volts, full scale.

Multimeters—14 Ranges—
1 microampere to 1 ampere. 20 microvolts to 1000 volts.

TYPE 502 THERMAL A.C. MILLIAMMETERS and VOLTMETERS

Can be used on A.C. or D.C.

Single Ranges—
From 1 milliampere to 1 ampere, full scale.
From 0.25 volt to 1500 volts, full scale.

Multi-ranges—
From 2 milliamperes to 1 ampere, full scale.
From 0.3 volts to 1500 volts, full scale.

Multimeters—14 Ranges—
From 2 milliamperes to 5 amperes.
From 60 millivolts to 1500 volts.

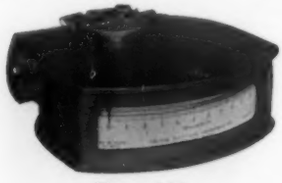
TYPE 515 THERMOCOUPLES

In Vacuo—From 2 milliamperes to 1 ampere.
In Air—From 0.5 amperes to 10 amperes.
Specials—For use on short wave frequencies.

TYPE 504 FLUXMETERS

For measurement of magnetic flux in maxwells or gausses, with electrical zero return. These are strictly portable and need no leveling.

TYPE 505 SWITCHBOARD PATTERN METERS and TYPE 507 SMALL METERS



Type 505

Type 507

Same ranges as Type 501. These cannot be supplied with internally mounted thermocouples.

TYPE 520 WATTMETERS—From 0.1 watt full scale up. Especially suitable for use on circuits having low power factors.

TYPE 520 DYNAMOMETER MILLIAMMETER and VOLTMETERS—From 10 milliamperes and 0.5 volt up; full scale.

OHMMETERS, TYPE 701—With self-contained battery and magnetic shunt to compensate for battery ageing. Suitable for measuring low coil resistances up to insulation resistance in megohms.

TYPE 704—Cross coil, independent of ± 20% battery ageing. From 1 ohm to 1000 megohms.

TYPE 508 ELECTROSTATIC VOLTMETERS

No power consumption on D.C. and very little on A.C. Full scale ranges from 120 to 3000 volts and up to 40,000 volts by the use of condenser multipliers. Measures true R.M.S. values. Special high ranges built on request.

Type 508

TYPE 503 SEMI-SUSPENDED MICROAMMETERS, MILLIAMMETERS and MILLIVOLTMETERS

The most sensitive portable meters manufactured. Although movement is carried on a suspension, the meter needs no leveling. Full scale ranges from 0.5 microampere and 0.1 millivolt up. Also supplied in multiranges.

Type 5053 — Similar to Type 505 but with semi-suspension element. Ranges from 0.75 microampere and 0.24 millivolt up.

Type 5073 — Similar to Type 507 but with semi-suspension element. Supplied in same ranges as Type 503. Price approximately 30% less than Type 503.

503

NEW DEVELOPMENT RAWSON TWIN MULTIMETER

Occupies less space than any other near equivalent meter. Covers all ranges of types 501 D.C. multimeter and 502 A.C. multimeter—29 in all.

Type 5012
Size 12″ x 8″ x 6″

WESTON ELECTRICAL INSTRUMENT CORP.

601 Frelinghuysen Avenue, Newark, N. J.

ENGINEERING AND SALES OFFICES

Albany	Cleveland	Jacksonville	Minneapolis	Pittsburgh
Atlanta	Dallas	Kansas City	Newark, N. J.	Rochester
Boston	Denver	Knoxville	New Orleans	St. Louis
Buffalo	Detroit	Los Angeles	New York	San Francisco
Chicago	Honolulu, T. H.	Meriden, Conn.	Philadelphia	Seattle
Cincinnati				Syracuse

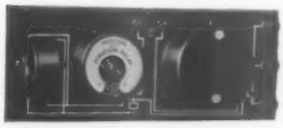
WESTON INSTRUMENTS

Standard for Instruction, Research, Industry

The use of WESTON instruments in educational work and scientific laboratories has become a fixed principle, for nothing short of WESTON accuracy and dependability are acceptable for engineering training. WESTON instruments are made to most exacting standards of craftsmanship and accuracy. They inspire students to be exact in experiments. And in using WESTONS in training, the student is familiarizing himself with the instruments he will use throughout his engineering career, for student graduates since 1888 have "Westonized" the industrial world.

Following is a condensed listing of the WESTON instruments available; also are illustrated a few of the models widely used in educational work. Complete information on all models is available in booklet form, and will gladly be sent on request.

MODEL 622
Ultra-Sensitive Microammeters, Millivoltmeters
Double pivoted type instruments for measurement of minute currents. Ideal for laboratory work and circuits involving thermocouples, pyrometers, electron tubes, etc.



MODEL 607
*** Photronic Photoelectric Relay**
Ideal to demonstrate theory and operation of photoelectric cells and sensitive relays. Consists of a WESTON Photronic Cell, a WESTON Sensitive Relay and a Power Relay mounted on a common base and wired. No outside voltage, nor troublesome amplifier required.

MODEL 280
Miniature Precision D.C. Instruments
Convenient and practical for student use, combining miniature size and ruggedness. Size 4⅜ x 4⅜ x 1½ inches. Accuracy 1% . . . hand calibrated mirror scales and knife-edged pointers. Available in single and multi-range instruments.

PORTABLE INDICATING INSTRUMENTS
Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

PANEL MOUNTING INSTRUMENTS
Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

INSTRUMENT TRANSFORMERS
Portable and Switchboard—Potential and Current

RELAYS
Sensitive and Power Uses—Current and Voltage Types

AIRCRAFT INSTRUMENTS
Tachometers, Temperature Indicators, Radio Compass Indicators, Ammeters, Voltmeters, etc.

ELECTRIC TACHOMETERS
A.C. and D.C. Types—Remote Indicating

LABORATORY STANDARDS
Voltmeters, Ammeters, Wattmeters

SPECIALIZED TESTING EQUIPMENT
Power Analyzer, Photoelectric Potentiometer, Battery Testing Instruments

SERVICE EQUIPMENT
Tubecheckers, Analyzers, Oscillators, Ohmmeters, Vacuum Tube Voltmeters

PHOTOELECTRIC CELLS
"Photronic" Cells—Dry Disc Type

PHOTOELECTRIC CONTROL DEVICES
"Photronic" Cell Controls, Illumination Controls, Smoke Alarms, Industrial Controls

LIGHT MEASURING DEVICES
Illumination Meter, Foot Candle Meters, Sight Meter, Exposure Meters

TEMPERATURE INDICATING INSTRUMENTS
ELECTRICAL TYPE—Remote Indicating
BIMETALLIC DIAL TYPE—Laboratory, Industrial

INSTRUMENT ACCESSORIES AND PARTS
Shunts, Cables, Resistors, Switches, Binding Posts, Leads, Multipliers, Adapters, Radio Plugs, etc.

STANDARD CELLS

* Photronic—A registered trademark designating the photoelectric cells and photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corporation.

MODEL 765
Volt-Milliammeter
Preferred by schools because of its high sensitivity and broad ranges. 10 D.C. voltage ranges, sensitivity 20,000 ohms-per-volt —10 A.C. volt ranges. 12 D.C. current ranges—10 D.B. ranges.

MODEL 430
Portable, Precision A.C. and D.C. Instruments
Universally used in schools and industry wherever rugged, portable instruments are required for general testing. Hand calibrated, mirror scales with knife-edged pointers.

MODEL 375
Student Galvanometer
Widely used in school laboratories where durability and low cost are requirements, rather than extreme sensitivity. Other models of medium and high sensitivity available.

EDISON STORAGE BATTERY

DIVISION OF THOMAS A EDISON, INCORPORATED

West Orange, New Jersey

SALES OFFICES IN THE FOLLOWING CITIES

Boston, New York, Buffalo, Philadelphia, Washington, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, Seattle, San Francisco, Denver

EDISON NICKEL-IRON-ALKALINE STORAGE BATTERIES FOR SCHOOL AND COLLEGE LABORATORY USE

EDISON Nickel-Iron-Alkaline Storage Batteries for school and college laboratories have two important advantages:

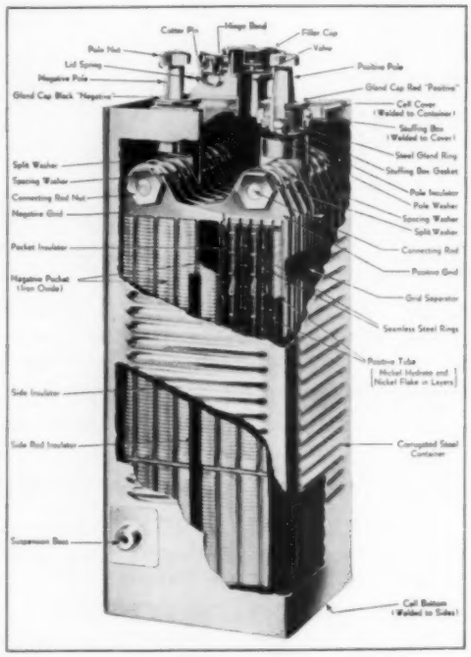
1. They are the most dependable and convenient source of d.c. for laboratory supply circuits.
2. They are the most extensively used type of storage battery in industry and hence the type with which the student is most likely to be concerned following graduation.

For D.C. Laboratory Supply Circuits

The Edison Nickel-Iron-Alkaline Storage Battery as a source of d.c. for laboratory supply circuits affords a dependability no other type of battery can approach. Use of steel for all structural parts combined with an alkaline electrolyte (which is a recognized preservative of steel) makes it practically indestructible and permits secure retention of all active materials within the plates.

Its charge and discharge results in the simple transfer of oxygen from one plate to the other. The fact that neither oxidation nor reduction, once completed, can be followed by further or other reactions, helps explain why it cannot be injured by overcharge, overdischarge, charge in reverse or other so-called electrical accidents.

These are some of the reasons for its great dependability, as well as its long life (2 to 5 times that of other batteries). Despite its higher first cost, it is the most economical battery to use.



Because of its all-steel cell construction the Edison Nickel-Iron-Alkaline Battery is the most durable made

A feature of especial value in school and college work is its ability to stand discharged during all vacation periods without need of attention and without suffering injury or deterioration of any kind.

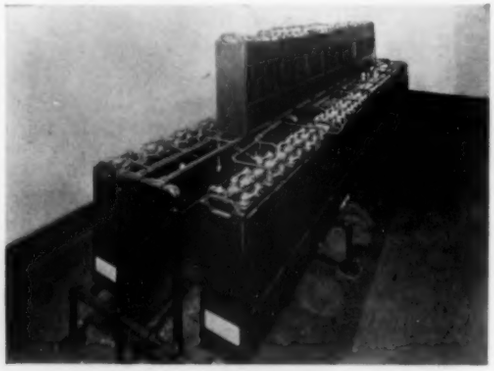
Another feature is the convenience of using any number of cells in a battery assembly to vary the voltage as desired. This may result in unequal discharge and subsequently in overcharge of some cells when the assembly as a whole is recharged. Unlike other batteries, however, the Edison Nickel - Iron - Alkaline Battery is not injured by such treatment.

As a Means of Training in Industrial Battery Applications

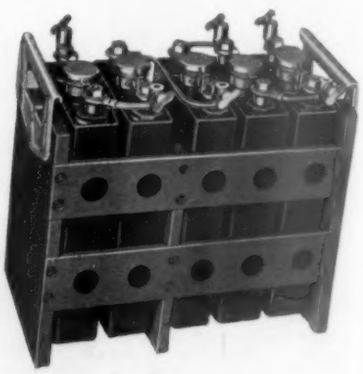
Practically every major industry in the United States uses battery industrial trucks for plant transportation and material handling.

Subways and other electrified railways use storage batteries for control purposes on locomotives and multiple unit cars. Mine locomotives, miner's electric cap lamps, ship's electric power stand-by, steam railway passenger car lighting and air conditioning are other important industrial storage battery applications. In all such services, Edison Nickel-Iron-Alkaline Storage Batteries are the type in most extensive use.

Instruction in their care, operation and construction is thus of very practical value to the student.



Typical stationary laboratory battery; consists of 100 A4H cells having a capacity of 150 ampere hours; through a switchboard the output of any number of cells is made available for experiments requiring variable direct current potentials



Typical portable laboratory battery; consists of 5 B2H cells having a capacity of 37.5 ampere hours; note special taps, supplied at no additional cost with this type of cell, which permit ready use of output of variable number of cells

THE ELECTRIC STORAGE BATTERY COMPANY

World's Largest Manufacturers of Storage Batteries for Every Purpose

Allegheny Avenue and Nineteenth Street, Philadelphia, Pa.

Atlanta, Ga., 210 Walker St., S. W.
Boston, Mass., 100 Ashford St.
Chicago, Ill., 4613 So. Western Blvd.
Cincinnati, Ohio, 718-19 Temple Bar Bldg.
Cleveland, Ohio, 6400 Hermann Ave., N. W.
Denver, Colo., 810 14th St.
Detroit, Mich., 8051 W. Chicago Blvd.
Kansas City, Mo., 129 Belmont Blvd.
Los Angeles, 1043 S. Grand Ave.
Minneapolis, Minn., 617 Washington Ave., N.
New Orleans, 428 Balter Bldg.
New York, N. Y., 23-31 W. 43rd St.
Philadelphia, Allegheny Ave. and 19th St.
Pittsburgh, Pa., Union Trust Bldg.
St. Louis, Mo., 1218 Olive St.
San Francisco, Cal., 6150 Third St.
Seattle, Wash., 1919 Smith Tower Bldg.
Washington, D. C., 1819 L St., N. W.

In Canada, Exide Batteries of Canada, Ltd., 153 Dufferin St., Toronto, Ont.

FOR
LABORATORIES
PROGRAM CLOCKS
FIRE ALARM
INTERIOR
TELEPHONES
AUTO-CALL

Exide
BATTERIES

FOR
AUTOMATIC AND
INSTANTANEOUS
EMERGENCY LIGHT
AND POWER
See Page 133

Exide Batteries, the product of The Electric Storage Battery Company, are extensively used in the laboratories of the nation's foremost scientists, industrial research engineers, schools and colleges. Their performance records are the best testimony that can be offered as to their merit for laboratory services. The foremost characteristics of Exide Batteries are absolute dependability and sustained high voltage until end of discharge.

Flexibility

The operation of an Exide Battery is flexible. Cell connections to the battery can be arranged so as to give any desired voltage, with a wide range in discharge rates available at that voltage. By assigning a group of cells of the battery to a definite experiment, a constant voltage is assured which is free from disturbance or interference by any outside influence.

An Exide Chloride Laboratory Battery Cell Cut-away to Show Unique and Sturdy Construction, Sealed Glass Jar Assembly

Improved Design Simplifies Maintenance

Exide Batteries of the sealed glass jar type have been carefully designed and are carefully constructed for laboratory service. A deep sediment space is provided at the bottom of each cell. Posts and connections are adequate for extremely high discharge rates and inter-cell connectors are of copper heavily coated with lead.

The structural details of Exide Batteries assembled in sealed glass jars have been so refined as to eliminate all maintenance attention other than recharging and an occasional addition of water, which, with automatic cell fillers, becomes a simple task.

Long Life

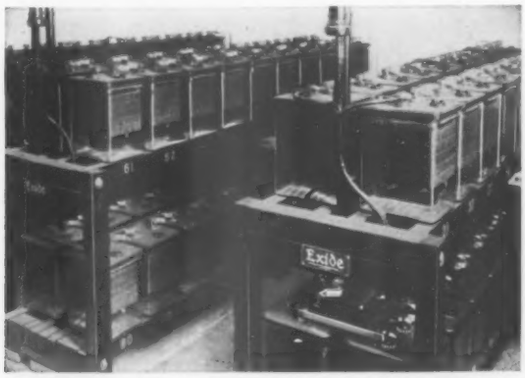
Exide Batteries are not only noted for their long life in laboratory service, but also in *all* types of industrial stationary service. *There are Exide-Chloride Batteries in laboratory and industrial installations which have been in constant use for 20 years and longer.*

For Any Budget

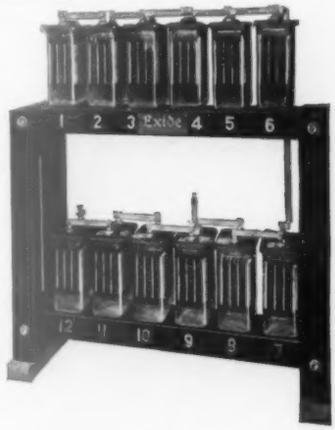
Regardless of how limited your budget appropriation, an Exide Battery can be selected to meet your requirements. They are available in a wide range of sizes and capacities, and can be installed so that cells may be added subsequently to obtain greater capacity.

Nation-wide Organization

We are prepared and equipped to help you with any laboratory battery problem which may present itself. The wide experience of Exide engineers and the services of our nation-wide Exide organization are at your disposal. Write to the nearest Exide office shown above for further information.



The Exide Chloride Battery in The Research Laboratory of Physics, Harvard University. It is Used for General Service Where Various Potentials from 2 Volts to 240 Volts Are Required



A Typical 12 Cell Exide Chloride Battery Widely Used in School and College Laboratory Work

SECTION XI
SHOP PLANNING AND EQUIPMENT

PLANNING AND EQUIPPING INDUSTRIAL ARTS LABORATORIES

BY WILLIS A. WHITEHEAD

Member of the Summer Session Staff, The Ohio State University; and Supervisor of Planning and Drawing, High School, Newark, Ohio

IN traveling about the country visiting schools, one frequently finds an apparent lack of planning with reference to the purpose of the building. This situation seems more acute when considering the elements of the structure than when dealing with it as a whole. However, schools are still being built with areas widely separated that should be grouped together if an integrated program of education is to be achieved. This failure to fit an educational structure to the purpose it should serve seems inexcusable when one realizes that education is probably the largest, the most complex, and the most important organized area of life activity today.

The blame for any failures that exist in the planning of educational buildings perhaps falls most completely on the educator himself. He is the one that should be well versed in a philosophy of education that will determine the nature of a structure to house the program. If he fails to have a viewpoint, or if he fails to make its implications known to the architect, an adequate plant can seldom be achieved.

Since Industrial Arts is being thought of as a part of general education, it seems important to consider the trends in this larger field before dealing with any technical planning of the Industrial Arts laboratory.

The Trend Toward a New Viewpoint in Education

Many adults of today have been subjected to the formalized type of education which stresses the acquisition of so-called facts within specific and remote fields of subject matter. That kind of schooling suggests buildings with standardized classrooms, and classrooms with rows of permanent seats where pupils may sit, read, listen, and recite bits of isolated information that someone has determined are important for them to memorize.

The trend in educational thinking today seems to be quite different. Leaders are promoting the cause of education for the improvement of individual and social living; democracy is conceived as a "way of life" instead of a form of government; the ideals of democracy are seen as values for living and consequently as values to be achieved in the process of education. Educational values are believed to include: applications of reflective thinking; development of attitudes dealing with social responsibility; dispositions to judge issues and act accordingly, as well as other aspects of personality. Learning and experience are considered synonymous; and the attempt to construct the curriculum of life activities is a constant challenge.

Concepts such as these have definite implications for the planning and equipping of buildings to house educational programs. There must be facilities that are conducive to thinking and planning, to testing hypotheses, to experimentation, to individual and group participation in activities of living, to self-expression, to promoting the development of consistent attitudes concerning issues of life, and to a great deal more. In short, school buildings need to provide opportunity for conducting a program that will promote the *whole* growth and development of many differing individuals.

A more complete understanding of the purpose and nature of education that is implied by this philosophy leads to the conclusion that schools need to be composed of laboratories and conference rooms instead of formal classrooms. It further indicates that the laboratories themselves need to be flexible in organization if they are to permit of dealing with the changing situations occurring in life and in educational procedure.

Industrial Arts in General Education

Industrial Arts is now held to serve the same function as any other specific area of the school; that is, it needs to direct its efforts toward promoting the development of values for living with respect to basic problems and issues that confront the individual in processes of daily life.

Growing out of this conception is an entirely different viewpoint with respect to the physical plan of the Industrial Arts laboratory. It must now embody facilities for experiencing as many phases of industrial living as possible. It must be beautiful and hygienic as well as efficient. It must have areas that are conducive to thinking and planning. Provisions for experimentation, for participation of groups and individuals in activities of living, for the expression of a myriad of interests and powers, for establishing real life problems, and for many other functions, are essential to achieving the program.

An observation of existing Industrial Arts laboratories shows the need for a thorough understanding of the relationship of educational principles and the physical setting of the laboratory. As in the case of total school structures, many Industrial Arts settings which have been built, and some that are still being built, do not demonstrate intelligent planning. The outlook is encouraging, however, when one takes cognizance of researches that have been undertaken within the past six years, dealing specifically with problems that are involved in planning for this area. It is also assuring to visit a number of well-planned laboratories that have been developed in certain sections of the country, and that have been designed upon the basis of principles derived through intelligent research. The writer believes it fair to state that Ohio probably leads the way in this respect at the present time.

Studies Relating to Industrial Arts Laboratory Planning

Perhaps the most comprehensive study dealing with the problem of physical planning for Industrial Arts that has been initiated is one that was started in 1932 at The Ohio State University under the direction of Dr. William E. Warner. This study is known as the School Shop Planning Investigation and divides the problem into nine major technical areas plus certain professional considerations and initial procedures. The nine major areas are: Location; Size and Shape; Principal Units; Auxiliary Facilities; Equipment Provisions; Building Details; Service Features; Lighting; and Noise.

Those studies that are either completed or under way deal with questions of: noises (1), lighting (2), principal areas (5),* service features and building details. These areas of study should give the reader some notion as to the breadth of the problem a planning specialist faces, and as to the intensity with which these problems are now being attacked.

The writer of this article has undertaken the study on Building Details. It includes questions concerning floors, walls, partitions, columns, ceilings, windows, doors, blackboards, bulletin boards, showcases, mezzanines and balconies, driveways and ramps, and special flues. Of these, the research on floors has been completed and considerable data gathered on several other items.

Floors

The floor is an important detail of any laboratory. Pupils and instructors walk on it all day long; materials are transported over its surface; danger is involved if it becomes too slippery; its wearing surface must be designed to endure; repairs must be kept at a minimum; it must be sufficiently insulated to be quiet and prevent transmission of noise to other parts of the building; it must not be so hard as to cause tools that are dropped to break; it must be easily cleaned; it must present a pleasing appearance; and it must not be so non-resilient as to be detrimental to health.

This study has involved an inspection of existing literature, correspondence with professional organizations and governmental agencies concerning tests and opinions, personal interviews with flooring specialists, and an analysis and evaluation of manufacturers' data.

The conclusions reached indicate that end-grain wood block, wood-block tile and 5/4 maple floors are most desirable, in the order named, for use in woodworking, printing, electricity, and similar areas. End-grain floors may be laid either by lateral nailing directly on concrete or on sleepers, or by the use of an odorless mastic compound. Individual blocks should contain eight or more annual rings per inch and should be treated with an odorless oil or parafin. Wood-block tile floors should be laid in odorless mastic according to the directions of the manufacturer. Maple floors of the 5/4 type need to be laid on sleepers and insulated either by using felt or by filling underneath with sand.

Drawing, art, and office areas require an entirely different type of floor. Here cork tile, rubber tile, mastic tile, and cork carpet have been found most suitable. None of these floors, however, should be laid directly on the ground floor unless the sub-floor is a waterproofed concrete slab, since moisture will cause them to warp and pucker.

Hot-metal areas such as foundry, forging, and welding require a floor that is non-combustible. In the case of the foundry, the floor should also be of a nature to prevent the spread of molten metal in

* This type of citation is used throughout the present article and refers to identically numbered references in the bibliography.

the event of breaking crucibles. A dirt or unfinished concrete floor is best for the foundry, with preference going to the dirt if the area can be located so that tracking into other parts of the building does not become a nuisance. Finished concrete floors are most desirable for forging and welding areas. These variations in flooring materials can be easily provided in the same laboratory if they are planned in advance.

An interesting finish for wood floors is now available which penetrates the wood rather than forming a surface coat, and results in a lustrous, hard finish. This finish may be left dull and gives a beautiful, non-slipping surface.

Although many interesting deductions have now been drawn from other phases of the study on Building Details, time and space will not permit reporting them. However, their implications will be embodied in the list of Principles of Industrial Arts Laboratory Planning that will appear later in the present article.

Procedures in Planning Industrial Arts Laboratories

The writer has found through his own experience and through contacts with specialists in laboratory planning that each of the following approaches is important to an adequate procedure.

1. A clearly defined and consistent philosophy of education, with its implications for all phases of the educational program.
2. The school and community survey, involving studies dealing with the character and growth of the community; character, size, and probable growth of the school population; economic status of the community; attitude of the community toward education; nature and extent of the existing school program; organization policies of the board of education; the ultimate school plant; channels of organization within the community; and others.
3. A survey and application of technical researches, and state and local building requirements, dealing with such problems as noise, building details, lighting, and so on.
4. A tentative plan of the laboratory: showing principal areas and facilities, equipment placement, and service features.
5. The final plan of the laboratory.
6. Design of special features and equipment.
7. Architectural and professional specifications.
8. Equipment specifications.
9. Presentation of the total program to the board of education.

Principles of Industrial Arts Laboratory Planning

A set of principles based upon a sound and consistent philosophy of education, as well as upon available technical researches, seems to be the best medium for acquainting architects and educators with the physical requirements of a program. Recognizing an absence of any such list, Warner and members of the Laboratory Planning Classes at the Ohio State University have prepared a most comprehensive one that is a direct result of experiences gained in establishing the Ohio Program (13).* They are herein reproduced without further comment:

GENERAL PRINCIPLES

Basic Considerations.—A laboratory should be thought of not only as a place for making projects, but equally as a place for planning, investigating, testing, experimenting, consulting, evaluating, . . . In short, the laboratory should be thought of as a place for thinking as well as feeling and doing.

Areas Represented.—Any basic industrial process or material adaptable to pupil use should be considered as a suitable and desirable basis for an activity in an Industrial Arts laboratory. Laboratories containing areas of planning and drawing, photography, library, conference, finishing, woodworking, ceramics, crafts, experimental science, graphic arts, textiles, electricity, radio and communication, foundry, forging, sheet metal, art metal, welding, machine metal work, and automotives including transportation, have been found most adequate in establishing life situations. Study, investigation, testing, and demonstration should be carried on to represent a still greater variety of industries. Experience has proven the advisability of providing rooms separated from the major area of the laboratory by steel and glass partitions, for radio, aeronautical experimentation with models, and conference. Obviously, the photographic dark room must also be separated from the laboratory proper, but should be located adjoining it.

The reference material or library should be considered as much a part of the laboratory as any tool, machine, or area, and should be provided for and utilized in much the same manner.

The instructor should have some designated area which includes a desk, typewriter, filing cabinets, etc., preferably located away from noise and dirt, but convenient to the reference and planning center and commanding as full a view of the laboratory as possible.

An assembly area should be provided as a service to all other centers in the laboratory. This area may well be in common with the space reserved in front of large outside openings where cars and trucks may be driven into the laboratory as needs arise.

Local limitations such as insufficient space or funds should be met by reducing the number of accommodations in several or all areas rather than by eliminating a complete area.

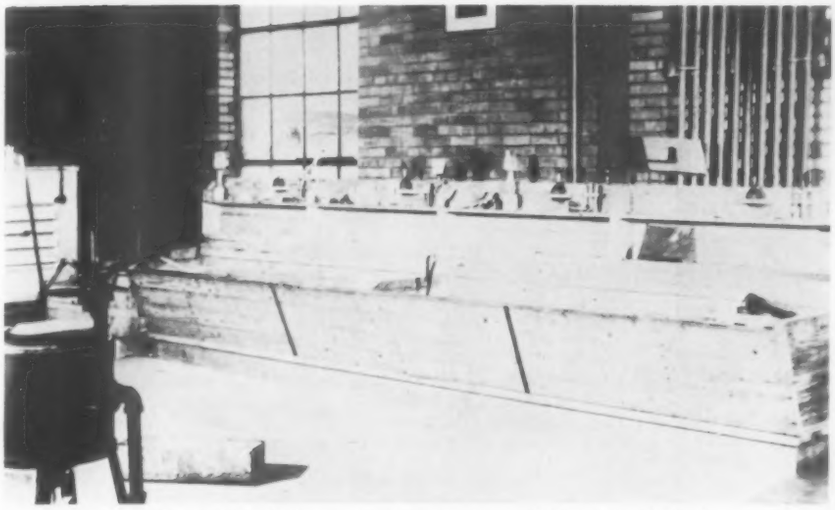
Nature of Equipment.—The maturity of the pupils who are to use the laboratory should be a guiding factor in the planning of equipment, particularly as regards size, weight, power, capacity, and safety of machine and hand tools.

Safety factors should be given first consideration in all laboratory planning. They become paramount in the placing of equipment. Any area should be visible from every portion of the laboratory. Such points also include the location of service facilities, the placement of the tool-room, the width and location of aisles of travel, and such items as light, color, and acoustical treatment. Machines around which exist danger zones such as jointer, band-saw, hack-saw, lathe, etc., should be so placed as to reduce—or better, eliminate—the possibility of pupils' being in line of danger. Such zones should be indicated on the floor by painted lines. Handling of hot metal in founding, forging, welding, etc., and the operation of hazardous machines such as the circular saw, jointer, lathes, band-saw, shaper, printing press, paper cutter, etc., should be isolated from all traffic and distracting interference as far as is possible.

Interference.—Pupil work stations should be so placed that interference from adjacent workers and aisle travel will be reduced to a minimum.

Flexibility to meet the challenge of changing programs and pupil needs should be provided for in any laboratory plan and installation. This implies that unassigned floor areas may

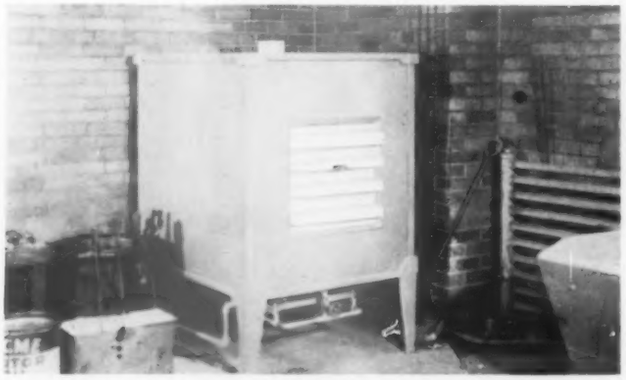
* This list of principles, as well as the one dealing with equipment selection, which will appear in a succeeding section, is now incorporated in the new Ohio High School Standards that have become effective during the past year (8—p. 140).



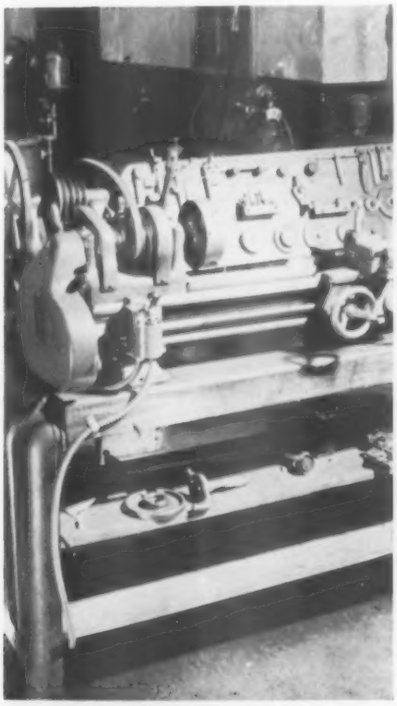
Foundry area. Note concrete floor surrounded by wood block

Blueprinting equipment

Graphic arts area. Note isolation of presses



Ceramic kiln

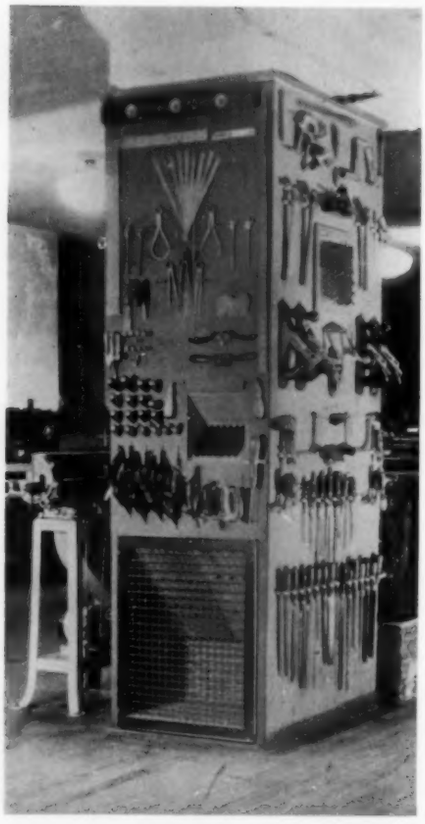


Metal machine lathe with tools and equipment localized

Electrical testing panels

Photography area, showing locker drawers for students

Above: The library study tables have individual lights



Left: Tool panels

Below: A planning, drawing and arts center, with wide center aisle and room at rear for drawing reproduction

occur; that large equipment should never be so integral with the building that it cannot be shifted; that individual drives on all machines become a necessity; that an abundance of well-distributed service outlets should be provided, in keeping with the desirability of semi-portable equipment. Expansion and alterations should be anticipated as a means of meeting further demands on floor space by new equipment or areas, large enrolments, character of the program, etc.

LABORATORY SIZE AND SHAPE

Size of the laboratory should be determined by the general rule of allowing a minimum floor area of 50 square feet per pupil. This figure includes storage space, tool-room, finishing room, dark room, planning room, etc., and is useful for laboratories planned to accommodate 25 pupils or more. Owing to the necessity of certain fixed items regardless of pupil capacity, the figure of 50 square feet per pupil must be increased proportionally as the classes reduce in size. Laboratories designed for operation by a single teacher should for administrative reasons not exceed 3,000 square feet in floor space.

Shape of the laboratory is most important. It should in general be rectangular and have a proportion of 1 to 1½ or 1 to 2. The width should never be less than 30 feet; preferably more. Irregularly shaped laboratories such as the "U," "L," etc., should be avoided as being quite unsuited to school needs.

A pupil station is defined as any location in the laboratory where a pupil may be engaged, as at a bench, a vise, in the tool-room, at a reading table. . . . Between 50 and 100 per cent more stations should be provided than the maximum number of pupils using the laboratory at any one time.

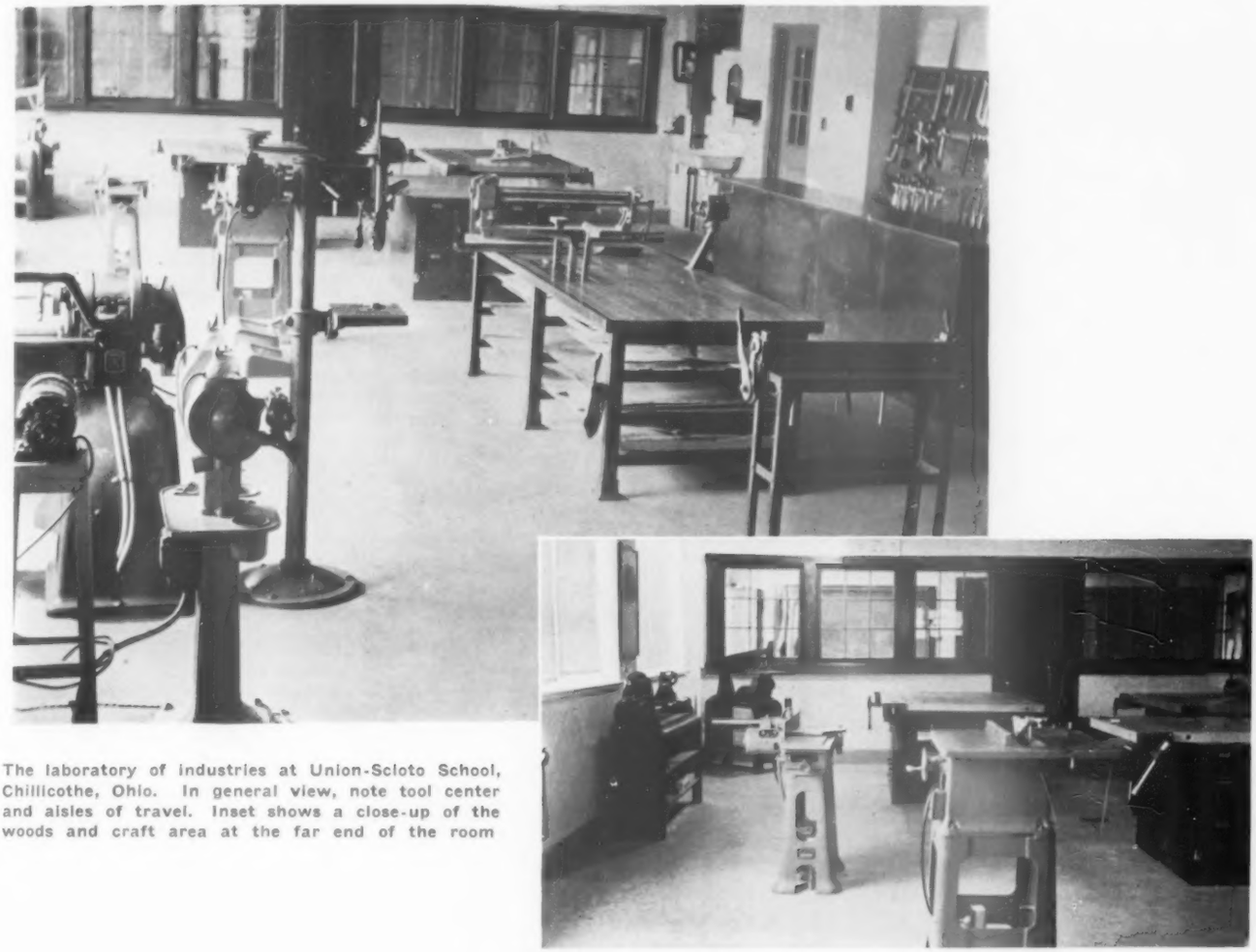
LABORATORY ARRANGEMENT

Distinct aisles of travel should be provided between all areas and points of common usage such as storage rooms, tool-rooms, and common machine areas. It may be deemed desirable to distinguish these aisles by lines painted on the floor. Areas should be so placed in relation to one another that a maximum working relationship exists. For example, areas of founding, forging, and welding have processes and materials in common and should be placed in close proximity to one another. The same might be said of machine metal work, sheet metal work, automotives, and electricity as well as photography, printing, bookbinding, . . .

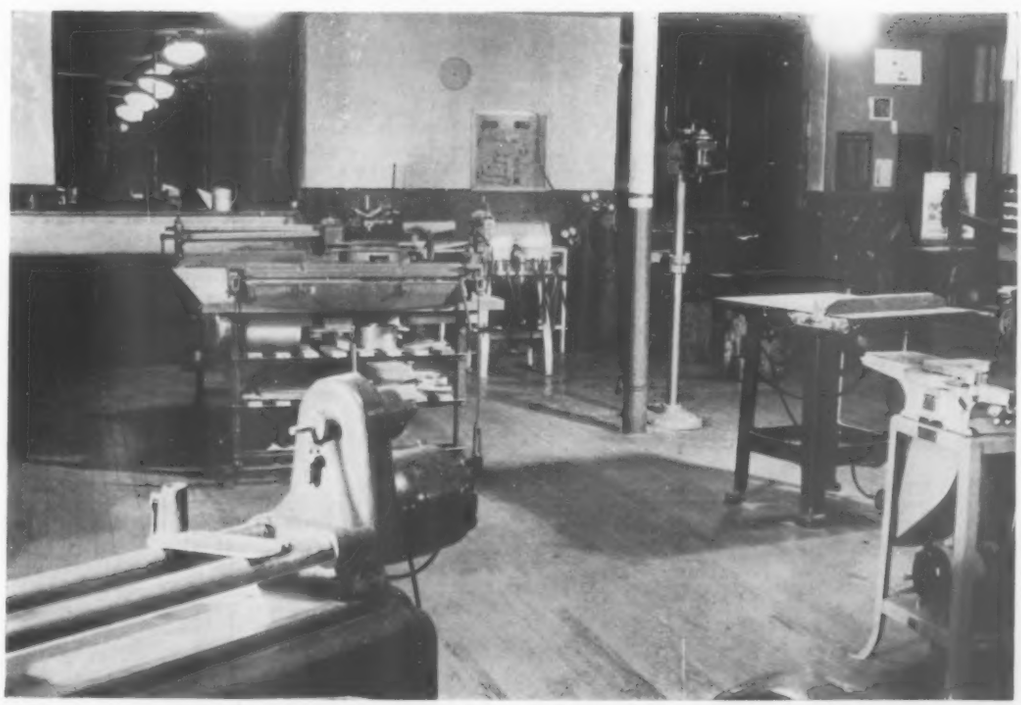
Cleaning Space.—Equipment occupying floor space should always be placed to allow for ease of cleaning around the base.

Tool and supply centers should be as centrally located as possible to reduce traffic and traffic interference to a minimum. Tool areas located in the center of the laboratory are probably ideal in this respect if they do not obstruct vision in the laboratory. Long, narrow rooms are not adapted to the central location of the tool area. The best thing to do in these cases is to place it against the wall in the middle of the long side. Laboratories more nearly square in shape may develop a tool area only counter high without upper screening as an excellent solution. Certain large pieces of equipment such as attachments peculiar to some one machine might well be placed adjacent to the machine on a small panel. This practice reduces traffic and demands at the tool-room, which will make for less confusion and better laboratory administration. Certain small tools peculiar to a single area may well be stored and distributed in kit form to reduce tool-room service to a minimum and speed up handling. This treatment is particularly adaptable to foundry, machine lathes, wood lathes, automotives, ceramics, and drawing.

Sequence of Operation.—Certain machines should be arranged with reference to sequence of operations and their relationship to other areas. The jointer is usually placed to the right and rear of the circular saw, but close to it, since these machines are frequently used alternately. The circular saw should be placed opposite lumber storage space to reduce the disturbance and danger of handling long lengths in the shop. Further attention should be given in placement of machines to assure adequate clearance for the work to be done.



The laboratory of industries at Union-Scioto School, Chillicothe, Ohio. In general view, note tool center and aisles of travel. Inset shows a close-up of the woods and craft area at the far end of the room



General view of the laboratory of industries at Jackson Township High School, Grove City, Ohio

Note the relationship of saw and jointer, pocketing of lathe operators, and use of column for locating drill

AUXILIARY FACILITIES

Storage and supplies for all areas may well be concentrated in a single storage room for ease of administration and control. No space, shelving, flat surfaces, etc., should ever be provided for storage unless some specific article or material is assigned to it. A place for nothing in particular is a place for everything in general, and anything belonging in the laboratory should have an assigned space.

Rough Trimming.—Power hack-saw, paper cutter, hand-saw, tin snips, or squaring shears, sawhorses, and other equipment used to prepare stock to size, might well be located permanently in the stock room. Such practice avoids the unnecessary hazard of handling large and awkward sizes of stock in the work areas of the laboratory, and eliminates the problem of returning unused pieces.

Racks and shelving should be provided for the orderly storage of all materials, including lumber, sheet metal, steel, paper, hardware, etc. Project storage, on the other hand, may be provided elsewhere to care for partially completed and finished pieces. Such storage space should be designed to protect the pieces stored.

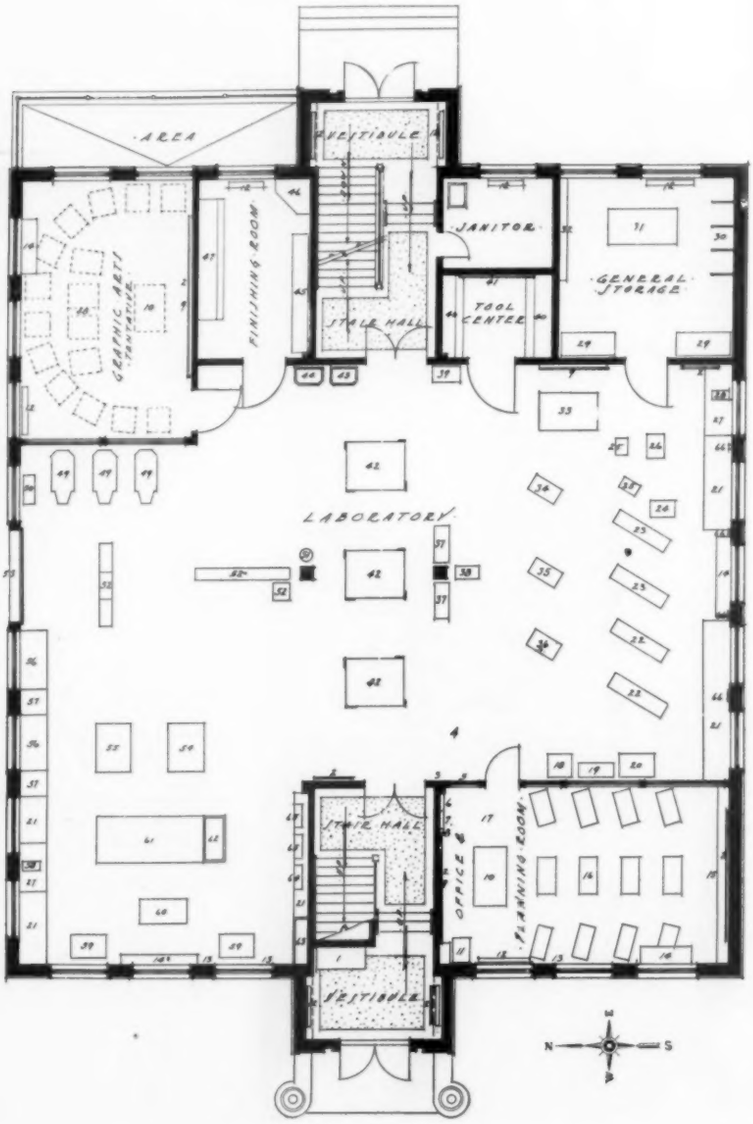
Student lockers for administrative reasons are best distributed about the laboratory rather than concentrated in a single area. Ganging and crowding is thus avoided. The pupils immediately scatter on entering. For purposes of economy of space, these lockers should be placed under bench tops where they become the bench body itself, thus serving a dual purpose. Distribution of lockers about the room is well provided for by this method.

ARCHITECTURAL AND SERVICE CONSIDERATIONS

An outside entrance should be provided large enough to admit an automobile or truck. The area at this door opening may well be utilized as a fabricating area for the sake of space conservation.

Exhibits.—Lighted exhibit and display cases are highly desirable and should occur both in the laboratory itself and in central locations, probably main corridors, in the principal part of the building.

Bulletin boards should be considered essential to the laboratory. One or more general bulletin boards should be placed in central positions such as the entrance to the laboratory and near the tool center. In addition to general bulletin boards, it is considered desirable to have a small board mounted near or in each work area. Posts and small wall sections may well be utilized in this manner. Wall space for permanent displays and a daylight projection screen should be provided. Blackboard space in several or all areas is considered advantageous. Extensive blackboard as well as bulletin-board space in the planning area is quite essential.

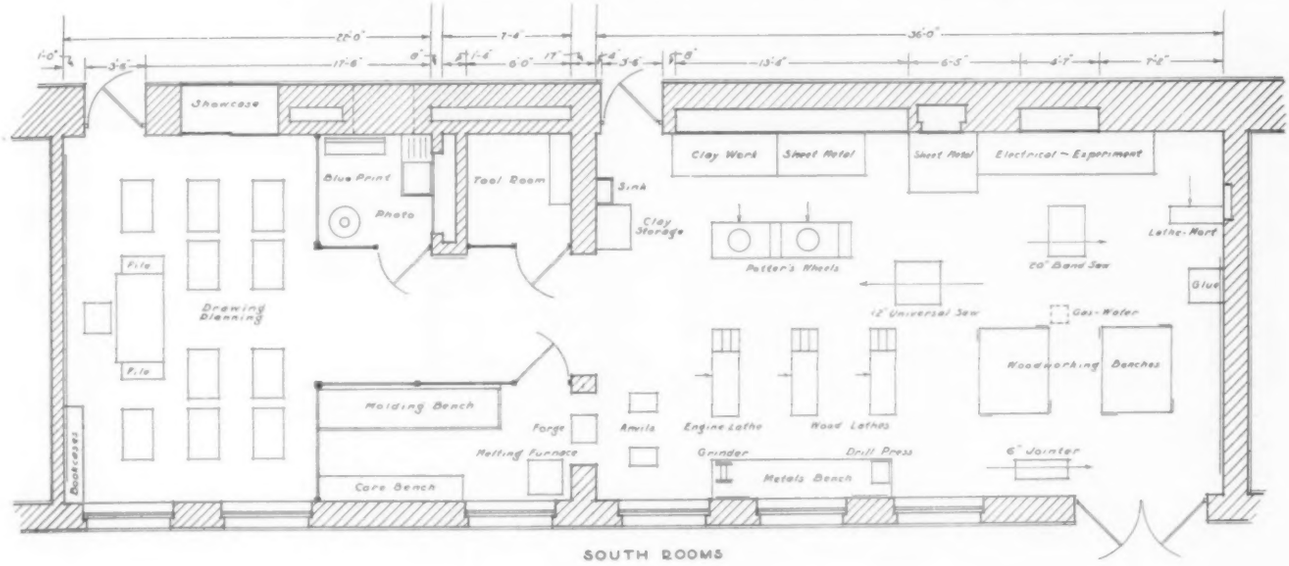


Arts and Industries Building, High School, Oberlin, Ohio

A building designed and built specifically to house a modern Arts and Industries program. The program is planned to serve boys, girls, and adults

LEGEND:

1. Showcase
2. Bulletin board
3. Acoustical plaster
4. Blox-on-end flooring
5. Glass partition
6. Power panel
7. Light panel
8. Public telephone
9. Blackboard
10. Desk
11. Filing cabinet
12. Radiator
13. Venetian blinds
14. Air conditioner
15. Bookcase
16. Drawing tables
17. Linoleum flooring
18. Vertical blueprinter
19. Blueprint washer
20. Blueprint dryer
21. Maple-top bench (metal lockers below)
22. Wood lathe
23. Metal lathe
24. Power hack-saw
25. Anvil
26. Forge
27. Asbestos bench cover
28. Soldering furnace
29. Storage cabinet
30. Wood storage
31. Glue table
32. Metal storage
33. Sheet metal bench
34. Belt and disc sander
35. Jointer
36. Circular saw
37. Jig-saw (wood and metal)
38. Drill press
39. Grinder
40. Metal tool cabinets
41. Open-panel tool rack
42. Square maple-top bench (metal lockers below)
43. Lavatory
44. Mirror
45. Open shelving rack
46. Spray booth
47. Cabinets for finishes
48. Desk-chair combination
49. Automotive assemblies
50. Automotive test panel
51. Drinking fountain
52. Hydraulic lift
53. Overhead automotive door
54. Automotive bench (mounted on rubber casters)
55. Kiln
56. Molding bench
57. Molding shelves
58. Metal furnace
59. Potter's wheel
60. Marble-top plaster bench
61. Ceramics bench (metal lockers below)
62. Ceramics sink
63. Damp cabinet
64. Plaster storage
65. Clay storage
66. Electrical demonstration panels



SOUTH ROOMS

Utilities.—Gas, water, electricity, and compressed air should be thought of as essential utilities for every Industrial Arts laboratory. A general distribution of outlets, particularly the electrical, should be provided.

Washing.—A sufficient number of washing facilities should be provided in the laboratory proper to allow a washing position for each ten pupils in the class.

Toilet facilities should be provided in connection with the laboratory or at least accessible nearby.

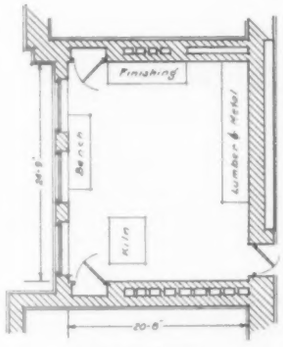
Natural light should be thought of as desirable and advantageous, though not dependable because variable. (See *Artificial light* below.) Precision equipment such as machine lathes, milling machines, drill presses, circular saws, jointers, jigsaws, wood lathes, grinders, drawing tables, etc., should be given preference in location with reference to natural light. Certain operations such as clay modeling, wood carving, and finishing are more effectively carried on under natural light because of the need for sensitive light and shade definition and delicate color discrimination. Natural light is best controlled by means of venetian blinds of light color and flat finish. The direction of the light source must be given careful attention in the placement of all equipment. Working positions directly facing windows are generally not satisfactory, with the possible exception of bench work. Even this practice may be objectionable along east, south, and west elevations.

Artificial light should supplement natural lighting to the extent that the artificial light *alone* will provide illumination that conforms with good lighting practice. Good general lighting should be provided to an intensity of at least 20 foot-candles at bench height in all areas, and this should be supplemented with additional local lighting on all machines and areas where precision work is carried on. In no case should a bare lamp bulb ever be visible. The surface of radiation from any light source should be as large as possible to reduce surface brightness—and hence glare—to a minimum.

Paint for walls, ceiling, and equipment should be semi-gloss of a good reflective and diffusing value selected in harmonious and pleasing colors artistically treated in a simple manner. Glossy surfaces on benches, machines, walls, etc., are to be avoided because of the glare they produce.

Power and light controls should be centralized on a control panel conveniently located in the laboratory. The tool-room, if one is used, serves well as a central control for both power and light.

The ventilating system for the laboratory should be separate and distinct from the rest of building for mutual benefit. A circulating washed-air system for the laboratory would be most desirable from the point of view of health and maintenance. All excessive heat and fumes should be cared for by ventilating the areas involved by means of hoods and exhaust



WEST ROOM

The Laboratory of Industries, High School, Westerville, Ohio

An Industrial Arts laboratory designed for a six-year high school and utilizing existing space in the building. Total High School enrolment—550

systems. Flues should be provided through which all gases may be carried to the roof. Separate flues for the finishing area and heating units are necessary.

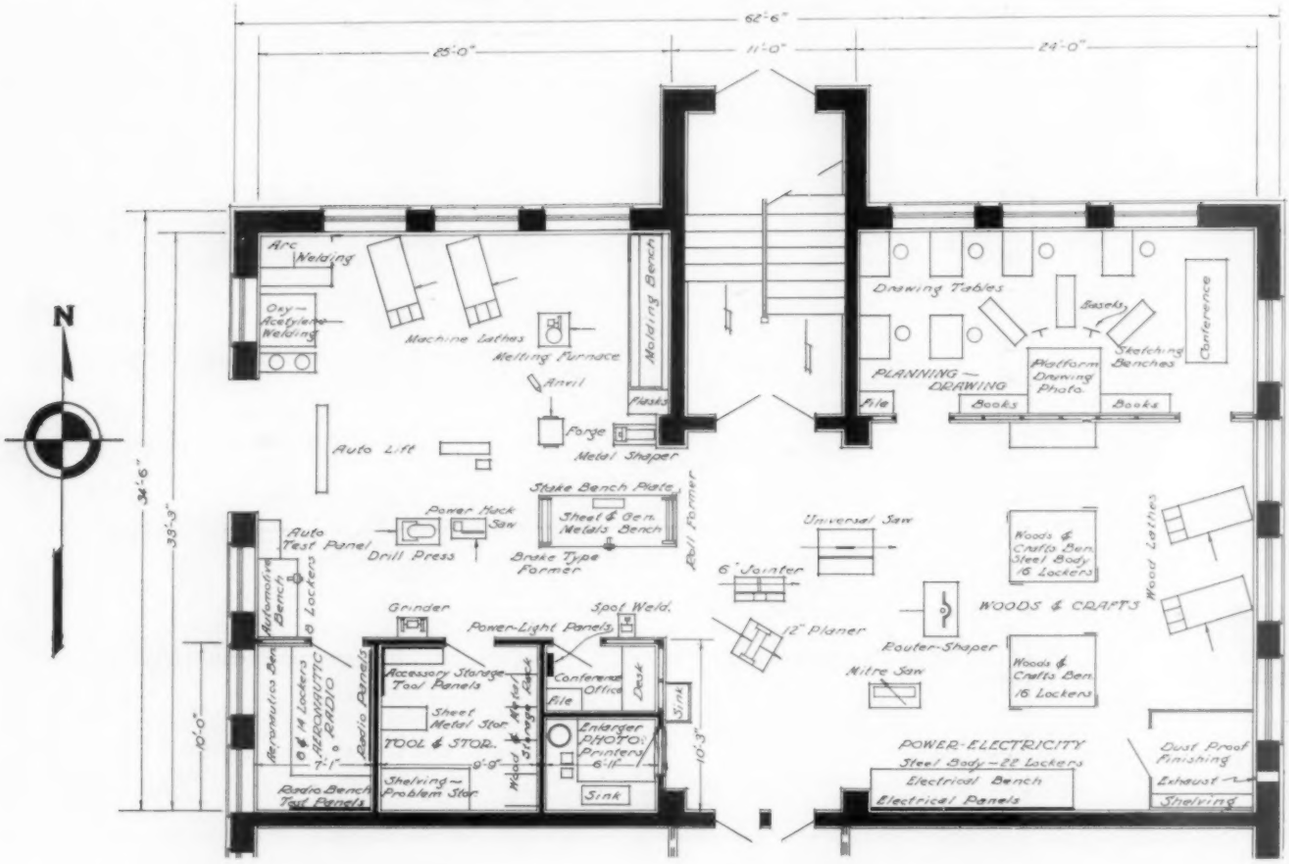
Dust- and refuse-collecting systems piped below the floor are to be considered highly desirable.

Heating units should be placed so as to avoid occupying useful space and interfering with operations. This suggests the consideration of recessed units or units suspended from the walls or ceiling.

Acoustical treatment is considered a necessity in all Industrial Arts laboratories. Both walls and ceilings should be so treated. A minimum treatment would at least provide for ceiling absorption of not less than 50 per cent. Maximum absorption possible is deemed desirable, especially if a ceiling treatment alone is used.

Floor materials shall be suitable to the area in which they are used. Wooden floors, probably maple or end-grain block, are deemed most suitable at present for all areas except those dealing with hot metals; namely, foundry, forging, and welding. Here the floor may well be concrete, flush with the wooden floor. A dirt floor is to be desired for the foundry if it can be provided without causing unsightly conditions in other parts of the laboratory. Soundproofing below wood flooring is to be recommended regardless of the location in the building. Rubber-mat floor covering should be used as a safety precaution where machine operators stand. This is particularly important on smooth and slippery floors.

Walls, from the floor up to a point of 5 feet, should be surfaced with some durable material easily cleaned and of a pleasing texture and color. Mat glazed brick, tile, formica micarta, enameled ⅛" prestwood, asbestos, tile or vitralite is



Arts and Industries Laboratory, High School, Shelby, Ohio. An industrial Arts laboratory planned for an addition to the existing building in a four-year high school. Total High School enrolment—458

satisfactory. Above this point walls should be plastered or treated with a sound-absorbing material.

Ceilings should be not less than 12 feet in height, and all laboratories should be ceiled with a material of a high coefficient of absorption—not less than 50 per cent.

Partitions, preferably of glass and steel, are desirable and essential for certain areas of the laboratory. Ideally, the maximum integration probably takes place where no partitions exist; thus in practice partitions when used should preserve as far as possible the unity of the laboratory by maintaining maximum visibility between the areas. This implies a 42-inch steel partition, the remainder being glazed to the ceiling.

Principles of Equipment Selection

A situation similar to that which has been noted with respect to the physical plant also exists in the problem of selecting Industrial Arts equipment. The practice of selecting equipment without relating that choice to the program it is to serve and the nature of the persons that are to use it has been all too prevalent. Recognizing a need for study on this problem, Elroy W. Bollinger and members of the Laboratory Planning classes at The Ohio State University have completed an intensive research dealing with equipment selection (4). As a result of their study, they have proposed certain guiding principles that may be used effectively in equipping a modern Industrial Arts laboratory. This proposal follows:

FUNDAMENTAL CONSIDERATIONS

The obvious basis for Industrial Arts equipment selection is the educational program which is to be achieved through its use. Cost, as such, is but a negative consideration at best and should be considered only after the program has been fully projected.

Each tool, each machine, each bench, and each piece of apparatus must provide for a maximum of pupil participation in its use. In other words, mere pressing of a button to perform an operation defeats learning. In addition to this, each item of equipment must represent a basic industrial process. It is only through an understanding of these processes and their effects that the pupil is enabled to interpret the infinite number of applications so characteristic of American life. Learning through experience for purposes of orientation in an industrial society requires a variety of equipment rather than a duplication of specialized items.

Safety is secondary only to educational criteria. This means that all equipment must be designed and built, and in turn selected and used, with specific reference to the size, height, strength, mental development and experience of the individuals who are to use it. Thus the capacity, weight, power, speed, and size of machines for Industrial Arts classes should be determined by the nature of the pupils who use them.

Obsolescence is also a factor which Industrial Arts programs and school officials must learn to recognize and face. American industry "re-tools" periodically for a world where change is the only certainty. The school is faced by the same certainty. The equipment manufacturer is now producing less costly equipment of smarter design to encourage periodic replacement. But the Industrial Arts program of today finds itself equipped, in effect, with horses and buggies in an age of complex machine transportation. If American people want their children to cope successfully with such an age, then the lessons for equipment selection seem to be most plain.

FUNCTIONAL FEATURES

1. Machines should be of the unit type in order to provide maximum efficiency, safety, and flexibility of arrangement. Combining a circular saw, mortiser, and jointer on a single standard reduces the usefulness and efficiency of each machine, besides resulting in unnecessary interference and hazards.

2. Machines should be designed and used for only one type of work. A drill press, for example, which is in such constant demand, should not be expected to serve as a router, a shaper, a sander, and a hollow chisel mortiser in addition to its principal function of drilling.

3. Automatic feed and control devices obscuring the principles of a machine should be avoided for Industrial Arts classes except for reasons of safety. Automatic feeds on mortising machines and drill presses, quick gear changes on lathes, and automatic press feeders, are cases in point.

4. Machines should be mounted on individual bases, preferably enclosed on all sides to the floor to facilitate cleaning both machine and floor. A machine mounted on a bench destroys in part the usefulness of both the bench and the machine.

5. The equipment provided in a laboratory should be of a size or capacity which will take care of the bulk, but not necessarily all, of the work which anyone would like to do. For example, there may be a distinct educational value in having a pupil himself take some work directly to an industrial shop or plant, where he will make new contacts, observe industrial methods, evaluate production costs, note merchandising procedures, and experience being handled as a customer.

SAFETY FEATURES

6. Essential safety features such as circular saw guards, jointer guards, pulley and belt guards, should be designed and supplied as integral parts of the equipment.

7. All moving parts of power-driven machines must be guarded or enclosed except those used directly in the operation itself.

8. All hand-operated machines that present hazards such as squaring shears, punch presses, paper cutters, etc., should be provided with effective guards.

9. All moving parts of a motor-driven equipment, whether guarded or not, should be free of projections such as setscrews, knobs, keys, etc.

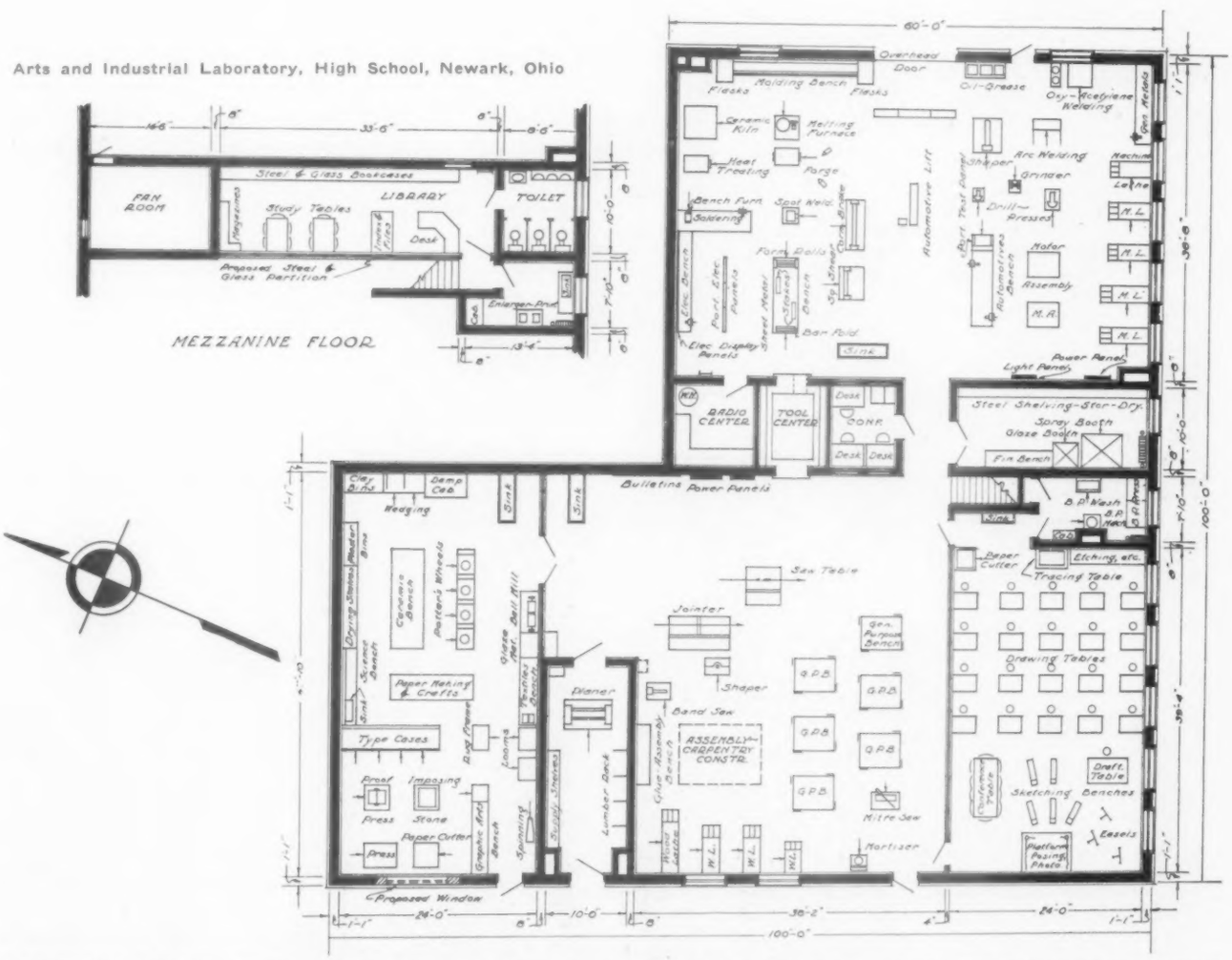
10. Guards, when used, must be simple in design, positive in action, and interfere as little as possible with the operation of the machine. Guards that adjust themselves automatically to the work being done are to be preferred over manual types.

11. All grinding equipment should be provided with shields of laminated safety glasses.

12. All motors should be equipped with overload protective devices of the thermal-relay or circuit-breaker type. These devices should be incorporated in the case with the motor switch control.

13. The size, capacity, and power of any machine should be determined with reference to the age, strength, height, and mentality of the pupils who are to operate it. It is questionable, for example, if any machine in a junior high school laboratory need be driven with a motor exceeding one horsepower.

Arts and Industrial Laboratory, High School, Newark, Ohio



An Industrial Arts laboratory planned for a three-year high school and serving students from one junior high school and one parochial school. Total High School enrolment in upper three grades—1,150. This plan shows a reorganization of facilities in an existing building that was originally built to house a Manual Training program. Both boys and girls are participating in the program

DESIGN FEATURES

14. The average elbow height of individuals who are to use a bench or machine should be the reference point in specifying the operation level of said bench or machine.

15. All machine tools should have individual motor drives, controls, and stands.

16. Power for any machine should be adequate to operate the equipment under its full rated capacity without unreasonable overloading of the motor.

17. "V" type belts are usually to be preferred to flat belts from the standpoint of power transmission and general efficiency. Flat belts, if used, should be of the endless type and may be preferred as a protective measure because of slippage on excessive overloads. This is particularly true where machines may be locked by jamming, as in the case of an engine lathe or milling machine.

18. All reciprocating or revolving machines and parts that work at high speed should be balanced and counterbalanced to reduce vibration to a minimum.

19. Machine standards should be sturdy and rigid in order to provide a solid base free from weaving and twisting for the machine it supports.

20. All handles, wheels, and mechanical controls should be of easy access to the operator, arranged not to interfere with each other, and be electroplated with an anti-corrosive metal.

21. Speed controls should be convenient, safe, positive, and of a range sufficient for the work for which the machine was designed and the experience level of the operator; e.g., beginning printing press operators require an unusually low press speed.

22. The use of detached knobs, wrenches, etc., for adjusting and operating a machine should be avoided as far as possible.

23. Machine parts such as saw blades, drill spindles, mortiser bits, etc., should be easily and quickly adjusted and interchanged without damage to parts.

24. Machines might well include housing space for extra parts and attachments that are used exclusively with that machine. Machine or cabinet bases should not interfere with the movements or comfort of the operator; e.g., toe room should be always considered in design.

25. Machines should be designed to allow the maximum amount of working space around the point of operation.

26. Power machines should be provided with switches placed within the operator's *natural* reach and vision while the machine is in operation, but so located that accidental switching is avoided.

27. Motor-driven machines of one horsepower or less should be equipped with a toggle or push-button type switch operating in a vertical position and placed within natural reach of the operator.

28. The quality and kind of materials used in the construction of machines for school use should be comparable to that used in machines for industry.

29. Sealed roller or ball bearings should usually be considered preferable to other types of bearing.

30. Collectors for shavings, dust, etc., should be an integral part of the machine. The machine should, however, lend itself to installation of a central dust-collecting system.

31. Where possible, motors should be housed within the machine, but made easily accessible for maintenance.

32. Flexible molded rubber power cords should be supplied and used with all portable and semi-portable equipment.

33. The need for periodic lubrication should be reduced to a minimum through such means as sealed bearings packed in grease or oil. Parts needing periodic lubrication should be fitted with snap-cover oil cups or alemite zerk fittings located for ease of identification and servicing.

34. Machines should be designed to operate with a minimum noise factor. At no time should the noise of any machine exceed 70 decibels.

35. Machines should be cushioned preferably with rubber mountings furnished as an integral part of the machine.

36. Machines embodying sheet metal construction should be treated with a noise-absorbing or -dampening medium glued or sprayed on inside surfaces.

37. Machines should be painted a distinctive color sufficiently light to have a light reflection factor of at least 40, be without glare, easy to clean, and of neat appearance.

38. "Local" lighting should be incorporated as an integral part of machines wherever possible.

39. Simplicity of construction and design should be considered desirable in all equipment.

Planned Laboratories in Ohio

Plans and photographs of several laboratories located in different sections of Ohio have been chosen as illustrations of design and equipment based upon a consistent philosophy of education. There are many other fine examples in the state. Some of these are: the experimental centers located at Grove City, Gahanna, and Westerville; the new laboratory in the Central High School at Euclid; the laboratory at Clyde; and the county-wide development of seven laboratories in Clinton County. A visit to any of these, as well as those shown, will demonstrate the results of thoughtful planning.

Conclusion

The purpose of this article has been threefold, namely: to project a concept of Industrial Arts as contributing to modern general education values; to suggest principles and techniques of planning that have been derived from experience as well as research; and to exemplify the practice of intelligent planning through selected illustrations. However, the problem of planning should not be considered as definitely and finally settled. We are living in a world where change is the only certainty. As progress is made, our concepts of the nature of man and his place in the universe must be constantly revised. Viewpoints in education must also change if they are to remain consistent with these vital and basic aspects. Those persons who are charged with the responsibility for planning Industrial Arts laboratories need to become constantly aware of these modifications if they desire to keep abreast of the implied program.

BIBLIOGRAPHY

1. Berglund, Erick B., and Fiedler, William R.: "School Shop Noises: An Investigation of Their Nature, Effects and Reduction." Unpublished M. A. thesis on deposit in the Ohio State University Library, Columbus. 1933. 116 pp.
2. Bollinger, Elroy W.: "Securing the Right Kind of Light." *Industrial Arts and Vocational Education*, March, 1933. pp. 135-141.
3. Bollinger, Elroy W.: "What Next in Physical Planning?" *Epsilon Pi Tau Review*, 135 East Woodruff Ave., Columbus, Ohio. 1933. pp. 16-19.
4. Bollinger, Elroy W., and others: "Principles of Industrial Arts Equipment Selection." Columbus, Ohio, Industrial Arts Area, Dept. of Education, The Ohio State University. Mimeographed. 4 pp.
5. Caswell, William E.: "Selecting the Units for the Secondary School Industrial Arts Program." Unpublished M. A. thesis on deposit in the Ohio State University Library, Columbus. 1932. 58 pp.
6. Christy, Elmer W.: "Automatically Controlled Shavings Collecting System." *Bruce's 1932 School Shop Annual*, The Bruce Publishing Co., Milwaukee, Wis.
7. Ohio Committee on Industrial Arts: "A Prospectus for Industrial Arts in Ohio." State Dept. of Education, Columbus. 1934. 101 pp.
8. "Ohio High School Standards." State Dept. of Education, Columbus. 1937. 192 pp.
9. Studebaker, J. W.: "Education for the Eighty-Five Per Cent." *Industrial Arts and Vocational Education*, May, 1938. pp. 179-182.
10. Warner, William E.: "Principles and Examples of School Shop Planning." *The American School and University*, American School Publishing Corporation, New York. 1930-1931. pp. 425-430.
11. Warner, William E.: "The Laboratory of Industries Plan." *Bruce's 1931 School Shop Annual*. Bruce Publishing Co., Milwaukee, Wis. pp. 261-266.
12. Warner, William E.: "Studies in School Shop Planning." *Industrial Arts and Vocational Education*, Bruce Publishing Co., Milwaukee, Wis. Feb., 1934. pp. 31-38.
13. Warner, William E., and others: "Principles of Industrial Arts Laboratory Planning." Industrial Arts Area, Department of Education, The Ohio State University, Columbus, Ohio. Mimeographed. 1936. 6 pp.

AMERICAN SAW MILL MACHINERY CO.

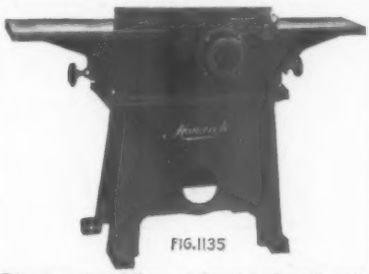
190 Main Street Hackettstown, New Jersey

We illustrate and briefly describe below a few of the more important MONARCH Woodworking machines suitable for school use.

MONARCHS are modern, fast, accurate, sturdy, moderate in price. There is no compromise with quality; you are assured a machine giving accurate work, trouble-free operation, and a lifetime of service.

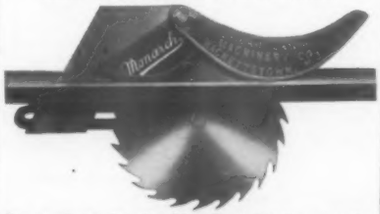
MONARCH machines are made throughout of the finest materials, and embody the best of workmanship and finish. These machines are guaranteed to give satisfactory service.

8" BALL BEARING JOINTER



Direct motor drive, or furnished with pulley for belt drive. A precision tool, suited for fine pattern making or hard, continuous general service

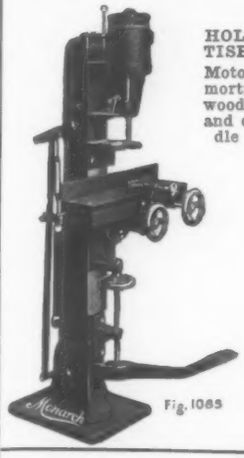
MONARCH PATENTED SAW GUARD AND KICK-BACK PREVENTER



In a class by itself. Completely guards both front and back of saw and provides absolute protection against "kick-back." Conforms with all safety requirements. May be applied to all our saw benches

TILTING ARBOR SAW BENCH

Ball bearings. 16" saw tilts to 45 degrees. Furnished with 2 or 3 H.P. motor. A modern, sturdy, compact machine with self-contained motor built in



HOLLOW CHISEL MORTISER—BALL BEARING

Motor or belt drive. For mortising in hard or soft woods. Free from vibration and easy to operate. Spindle speed, 3600 R.P.M.

20" BALL BEARING BAND SAW

Built-in motor. Fully guarded, with indexed tilting table. A rugged, accurate machine, giving fine work and long life. ALSO 30"

VARIETY TILTING TABLE SAW BENCH

Ball bearing. Designed for a wide variety of fine and accurate work. Can be supplied with hollow chisel mortising attachment

12", 16" AND 20" BALL BEARING JOINTERS

Latest improved jointers with all adjustments and appliances. Three point floor contact providing rigidity and allowing operator to stand close to machine. Dust proof motors mounted direct on spindle, if desired

HIGH SPEED SINGLE SPINDLE SHAPER

Precision ball bearings. 10,000 R.P.M. Cuts without reversing against, across and with the grain. Quantity production with highest efficiency

HEAVY DUTY TILTING ARBOR SAW BENCH

New 5 H.P. Machine; ball bearing motor mounted on arbor. A modern, large capacity machine for accurate work. Four styles of tables — stationary and rolling; regular and extra wide

WOODWORKING MACHINERY OF HIGHEST QUALITY FOR INDUSTRIAL SCHOOLS

Monarch
Trade-Mark Reg. U. S. Pat. Off.

SEND FOR THE BULLETINS ON THOSE MACHINES IN WHICH YOU ARE INTERESTED

THE AMERICAN SCHOOL AND UNIVERSITY

STANLEY TOOLS

EDUCATIONAL DEPARTMENT

New Britain, Conn.

STANLEY "Boy Proof" TOOLS

FOR WOODWORKING AND FARM SHOPS • ELECTRICAL SHOPS • FORGE SHOPS SHEET METAL SHOPS • AUTOMOBILE SHOPS • MACHINE SHOPS

No. 52½ 10 Oz. HAMMER

Super heat treated head. Evertite oil treated handle of selected straight grain hickory. Patented wedges.

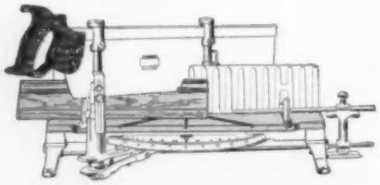
No. R40 EVERLASTING CHISEL

No lost or battered handles. Rubber composition handle, practically unbreakable, moulded about shank. Blade, shank and head one piece of finest steel.

No. 617 HAND DRILL

New chuck with hairpin type springs. Heavy crank, solid wheel, several other important features. ¼" chuck capacity. Hand Drill No. 626 has ⅜" chuck capacity.

No. 2246 MITRE BOX

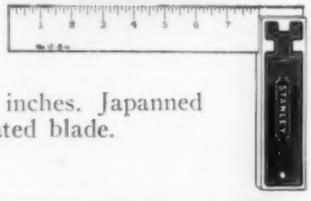


Simplified design. Swivel and uprights one piece of malleable iron. Malleable iron saw guides with roller bearings.

No. 80M SCRAPER

Practically unbreakable. Body and handles one piece of malleable iron.

No. 12 TRY SQUARE



Graduated in eighths of inches. Japanned finish handles. Nickel-plated blade.

No. 34½V BOX-WOOD RULE

Improved vertical figures—easy to read in any position. One side graduated in eighths of inches—other side in sixteenths. Brass tips protect ends.

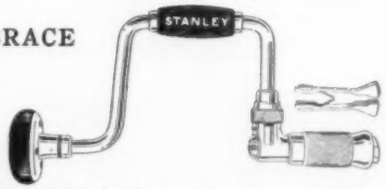
No. 5¼ JUNIOR JACK

Well balanced, lightweight. Ideal size for Junior High School student.

No. 118 BLOCK PLANE

All steel. Minimum number of parts. Lowest cutting angle.

No. 919 BIT BRACE



Self-centering chuck, all parts locked in place. Bronze bushed ball bearing head. Made with 8, 10, 12 and 14 inch sweep.

No. 20 SCREW DRIVER

Standard blade. Blade, shank and head hot forged from one piece of steel.

No. 340 SOLDERING IRON

Electric—95 watts. Pure copper tip. Hermetically sealed heating unit. Hardwood, adjustable handle.

•

SEND FOR SPECIAL SCHOOL CATALOG NO. 34

Catalog 34, in its 204 pages, contains much useful material in addition to complete descriptions and specifications on Stanley Tools. Get your copy free and use it as a handbook for tools and their use.

* * * * * * *

Write for Information on STANLEY VISUAL TEACHING AIDS

STANLEY ELECTRIC TOOL DIVISION

THE STANLEY WORKS

New Britain, Connecticut

STANLEY

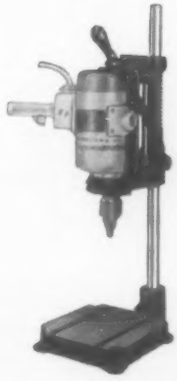
"VICTOR" DRILL

No. 124—½" Capacity

A most practical size electric drill for the School Shop. Round shank twist drills and bits, hole saws, countersinks, plug cutters, etc., can be held in this three-jaw geared chuck. Complete line of electric drills, sizes 3/16" up to 7/8".

DRILL STANDS

There is a Stanley Drill Stand available for all Stanley Electric Drills. They make a practical combination for the School Shop.



HAND ROUTER No. 10

18,000 R. P. M.

Adds the professional touch to projects. High speed produces smooth work—sanding practically unnecessary. It will perform countless woodworking operations — shaping, inlay work, routing, templet work, veining, relief work, grooving, rabbeting, corner beading. Bench Stands and Attachments available for converting to a spindle shaper.

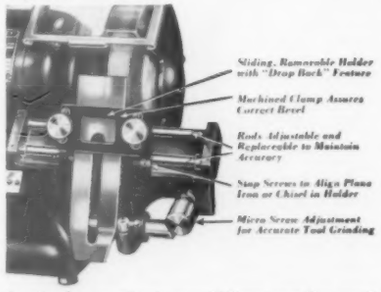
TABLE SHAPER No. 41

Uses same Motor Unit as Router No. 10. Table has patented motor holder that tilts to 45°. By rearranging 4 different cutters on the spindle and changing angle of motor unit, a wide variety of shaping cuts can be obtained. Steel table top is 12"x18"x3/8" on 8 7/8" gray iron legs.

EDGE TOOL GRINDER No. 667

Ideal for the School Shop. Ball bearing, 7"x1" wheels — one wheel specially designed for edge tool grinding, one wheel for general purpose grinding. Motor operates at slow speed. Equipment includes Plane Iron and Chisel Grinding Fixture, Safety Eye Shields, Adjustable Light Fixture.

PLANE IRON AND CHISEL GRINDING FIXTURE No. 568

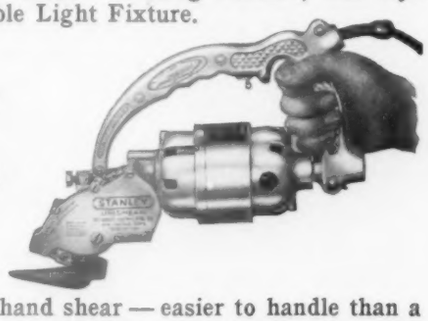

Sliding, Removable Holder with "Drop Back" Feature
Machined Clamp Assures Correct Bevel
Rods Adjustable and Replaceable to Maintain Accuracy
Stop Screws to Align Plane Iron or Chisel in Holder
Micro Screw Adjustment for Accurate Tool Grinding

Designed to keep edge tools in perfect condition easily and accurately. Furnished with Nos. 667 and 667E Grinders

COMBINATION GRINDER AND SANDER No. 667E

Ball bearing. Special wheel for edge tool grinding, 7"x1", 8" sander plate. Sanding discs available for wood or metal work. Motor operates at low speed. Complete with Sanding Plate and a Mounted Disc, Plane Iron and Chisel Grinding Fixture, one Eye Shield, Adjustable Light Fixture.

"MIGHTY MIDGET" UNISHEAR



Motor driven hand shear — easier to handle than a pair of snips. Cuts 18 gauge hot rolled steel or galvanized iron as fast as you can feed it. Cuts large sheets or small pieces easily. 100% safe.

Write for catalog on Stanley Electric Tools and the Stanley Router and Shaper for School Shops.

WALKER-TURNER CO., INC.

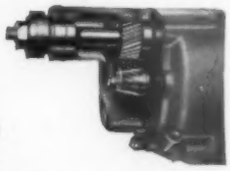
39 Berckman Street — Plainfield, New Jersey

Up-To-The-Minute Tools for School Shops

FOR years, Walker-Turner research, engineering and production facilities have been devoted *solely* to precision power tools for "light" duty. This is your guarantee of up-to-the-minute design and construction in any Walker-Turner Tools you install in your shop. It is also the reason why hundreds of industrial plants choose these tools for light production operations.

Specialization also contributes to manufacturing economies which enable us to offer tools of highest merit, at remarkably low prices. Because limited space prevents description of the many superior features of the tools illustrated, we urge you to obtain our Catalog which gives full details.

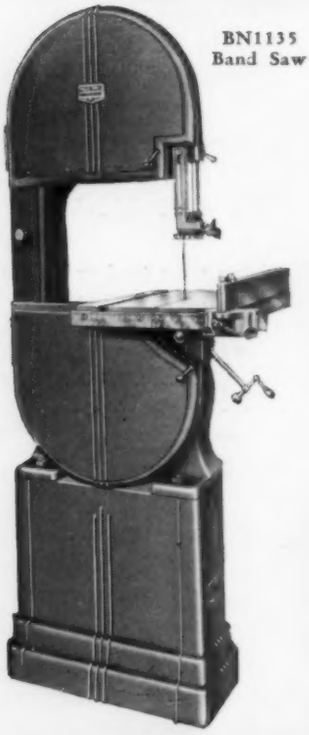
GEARED DRIVE!



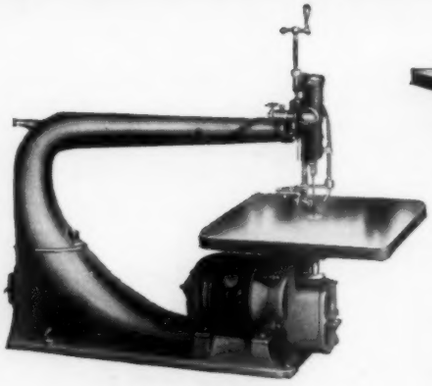
No Belt Troubles Delivers 30-40% More Power!

Precision-cut gears, meshing positively, without slippage or waste of power—actually deliver 30% to 40% more power "to the blade" than old-fashioned belt and pulley drive. And it is as trouble-free as an auto transmission.

WRITE FOR NEW WALKER-TURNER CATALOG..

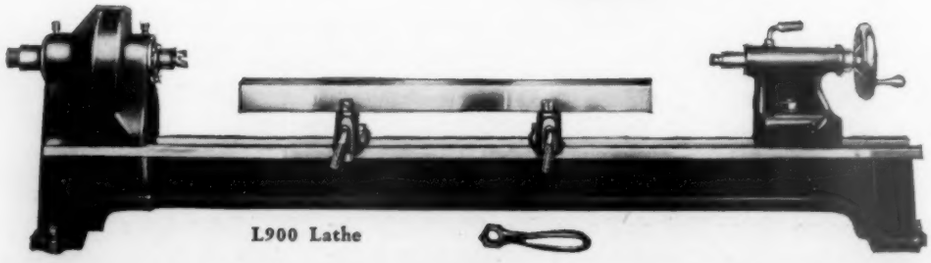


BN1135 Band Saw



MJ917 Jig Saw

TA1165 Tilting Arbor Saw



L900 Lathe

WALKER—TURNER

THE AMERICAN SCHOOL AND UNIVERSITY

Quick Facts About Walker-Turner Tools Illustrated

MJ917 JIG SAW has the Direct Drive with crankshaft mechanism. Fingertip Speed Control that flips from low to high speed without stopping the motor. Motion Blade Tensioner which permits accurate tensioning while in motion. Throat capacity of 24″. 15x14″ Tilting Table.

B966 BENCH SAW has a 10″ blade that cuts to a full 3″ depth. Big 21″x15″ table, 21″x31″ with extensions; tilts for angle cuts to 45°, by hand wheel and worm gear mechanism. Arbor raises and lowers. Mounted on dust-proof ball bearings.

GR50 GRINDER has ½ H.P. capacitor start motor with a high grade condenser built into the base. Provides ample overload capacity. Large grease-sealed ball bearings. 7″x1″ wheels turn at 3450 R.P.M. Full protection guards, safety glass shields, and cooling cup are regular equipment.

L900 LATHE turns wood up to 37″ long. Has 10″ swing over bed. Can take larger face plate work on outside end of head spindle. Built sturdy enough for metal turning and spinning with Walker-Turner accessories. Hollow head spindle ⅝″ inside diameter, mounted on ball bearings of ample thrust and radial capacity. Morse Taper centers.

BN1135 BAND SAW rips any length, cuts exact angles measured by the mitre gauge, arcs and scrolls as fed, bevel cuts any angle to 45° by the patented table tilting device. Capacity 16″ blade to frame, 12″ upper guide to table. 2900 feet of saw teeth a minute slice thin stock or "hog" through beams. Ball bearings on shafts and guides. All-around safety with wheel guards, back blade guard, and front telescoping guard.

P906 JOINTER has three special steel knives that plane stock up to 6″ wide, any length, and rabbet corner cuts to ½″ deep. Dual-purpose guard provides real safety even when planing to ribbon thickness or strip width. Both tables adjustable on dovetail ways for depth of cut. Fence tilts forward or backward for angle work. Ball bearings on spindle.

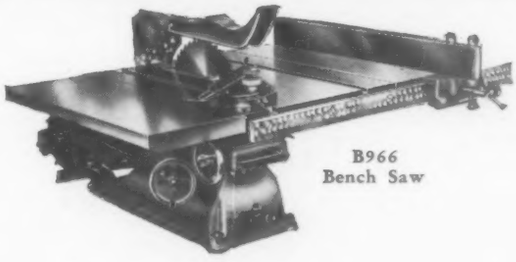
D925 DRILL PRESS has exclusive Walker-Turner six-spline spindle that minimizes vibration. Four precision ball bearings. Pilot wheel feed with calibrated depth stop lowers spindle 4″. Unusually soft yet positive return spring action. 10″x9″ table tilts to any angle. Jacobs (0″ to ½″) key chuck. Four speeds. Rigid 2¾″ steel column. Available in floor model.

TA1165 TILTING ARBOR SAW—10″. You can make full 3″ cuts or move the saw arbor effortlessly to any angle up to 45° and cut through 2″ with table level. Has Direct Geared Drive. An 8″ saw with similar quality features is also available.

S985 SPINDLE SHAPER has ¾ H.P. motor and new "direct gear drive" turning the spindle at 7600 R.P.M. Does all forms of shaping as well as tenoning, dadoing, reeding, fluting, surface grinding, drum sanding, panel carving, and lock corners for boxes. Hand wheels raise and lower spindle, adjust fences. 26″x16″ table. Safety guard. Ball bearings.

DESCRIBES 3 LINES OF TOOLS AND ACCESSORIES

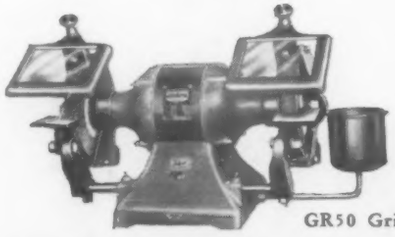
S985 Spindle Shaper



B966 Bench Saw

P906 Jointer

D925 Drill Press



GR50 Grinder

Engineered POWER TOOLS

THE AMERICAN SCHOOL AND UNIVERSITY

YATES-AMERICAN MACHINE COMPANY

201 ST. LAWRENCE AVE., BELOIT, WISCONSIN

J-45 SPINDLE SANDER

J-50 SHAPER

YATES-AMERICAN "J" LINE

With this coordinated group of modern machines you can put into practice the newer, progressive ideas in vocational education. They are safe, sturdy, economical to operate and are built to the same high standards as Yates-American industrial-type equipment.

J-45 SPINDLE SANDER

Oscillating. Ruggedly built for continuous service. Table adjustable vertically and may be tilted 15° right and 45° left. Spindle runs in large sealed ball bearings. Oscillation mechanism is entirely enclosed within the base.

J-50 SHAPER

Heavy base assures smooth operation. Heat-treated table has finely finished surface. Alloy steel spindle runs in precision-type ball bearings which are lubricated by a mist of filtered oil. Cutterhead is completely guarded.

J-18 SURFACER

Every moving part fully enclosed. Has sturdy variable speed drive. Three-knife safety cylinder cutterhead mounted in special high speed ball bearings. One-piece box-type frame. Available in 14" and 18" widths.

J-20 VARIETY SAW

Tilting arbor. One piece cast-iron base. Heavy, accurately machined table. Dustproof, fan-cooled, ball bearing motor is totally enclosed. Built-in dust chute. All controls are located within easy reach of operator.

J-40 MORTISER

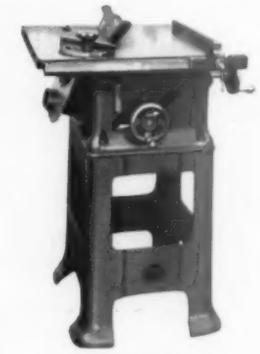
Motor mounted directly on the spindle—entire unit lowers on gibbed ways. Built-in blower removes chips from work. Hand-wheels provided for raising and lowering table. Can be quickly converted for use as a borer.

J-31 HAND JOINTER

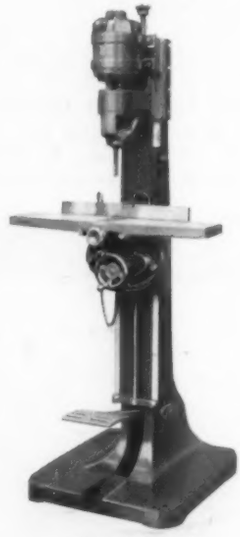
Modern in every respect. Cutterhead speeds of 3600 R.P.M. and 4250 R.P.M. available on direct motor drive and belted motor drive models respectively. Has 2½" overwidth on infeed table for rabbetting. Table available in 6" and 8" widths —36", 42" and 50" lengths.

J-47 DISC AND BELT SANDER

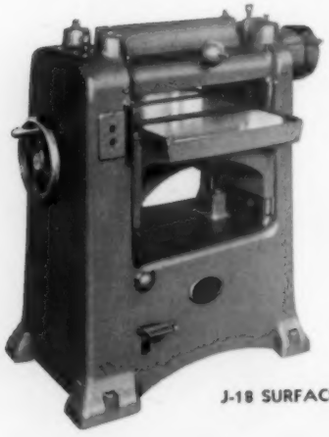
Belt sander can be operated horizontally or vertically. An adjustable table is provided for vertical operation. Disc sander is furnished for right and left hand mounting. A compact, versatile machine. Sturdily built.



J-20 VARIETY SAW



J-40 MORTISER



J-18 SURFACER

J-47 DISC AND BELT SANDER

J-31 HAND JOINTER

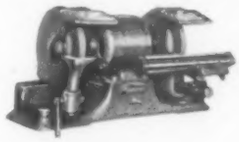
YATES-AMERICAN

THE AMERICAN SCHOOL AND UNIVERSITY

YATES-AMERICAN "W" LINE

These are **primarily,** not incidentally school machines . . . the result of an insistent demand on the part of instructors for a group of Yates-American machines smaller than the "J" Line, but equal in quality. They incorporate modern design, quality construction and accurate workmanship . . . are definitely not "hobby" machines offered on a price basis.

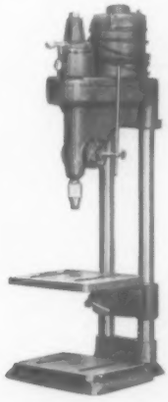
W-55 Variety Saw This 10" tilting arbor variety saw is the newest member of the line. Triple "V" belt or direct motor drive. Heavy welded steel frame. Saw dust hopper is built-in. Doors give instant access to entire operating mechanism. One-piece 29"x36" table is ground to a perfect finish. Hoist shaft and screws run in Oilite bearings—no lubrication required. Extra large capacity.



W-80 Grinder Substantially built to resist heavy shock loads and hard usage. Danger zone completely guarded. Equipped with laminated safety glass eye shields. Bit and knife grinding attachment available.

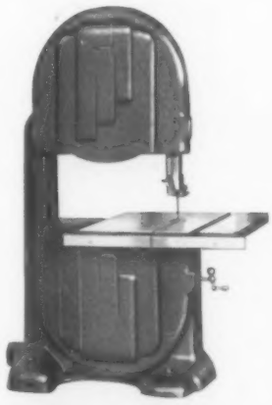
W-90 — W-95 Disc and Belt Sander This combination will perform a wide range of sanding operations. Disc sander has scientifically balanced disc. Belt sander has easily removable hood with cross fence attached.

W-20 Lathe Equipped with MULTISPEED Drive. Speeds can be changed without stopping machine or touching belt. Large capacity—14" swing—31" between centers. Belted, belted motor and direct motor drives.



W-30 Drill Press Equipped with MULTISPEED Drive. Substantial base, rigid supporting columns, built-in spindle lock and depth gauge. Spindle and quill chromium plated. Production type table available.

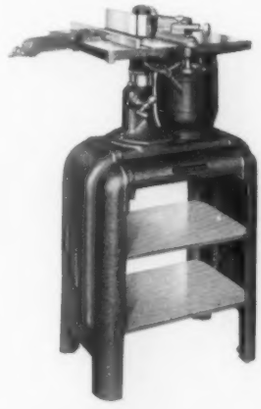
W-70 Jig Saw Equipped with MULTISPEED Drive offering unusually flexible speed control. Fully enclosed motor and driving assembly located to rear and below table within the base. Modern in design.



W-14—W-16 Band Saw One-piece, cast-iron frame with built-in dust chute. Trunnion mounted nickel-alloy, cast-iron table. Industrial type straining device. Top and bottom guards are accessible.

W-50 Circular Saw Frame, saw arbor housing and dove-tailed ways are cast in one solid unit. Cannot be sprung out of alignment. Heavy trunnions support nickel-alloy cast-iron table. Eight inch.

W-40 Hand Jointer Knives are entirely covered on both sides of fence and fully enclosed below. Fence cannot stick or jam. Industrial type cutterhead. Built-in dust chute. Full length inclined ways.



W-110 Shaper Equipped with exclusive tilting table if desired. Highly polished table needs no breaking in. Choice of 8,000 or 10,000 R.P.M. Completely enclosed. fabric-belt drive. Fully guarded.

YATES-AMERICAN

THE AMERICAN SCHOOL AND UNIVERSITY

BROWN & SHARPE MFG. CO.

Providence, R. I.

"World's Standard of Accuracy"

GRINDING MACHINES

Universal — Plain — Surface — Cutter and Tool

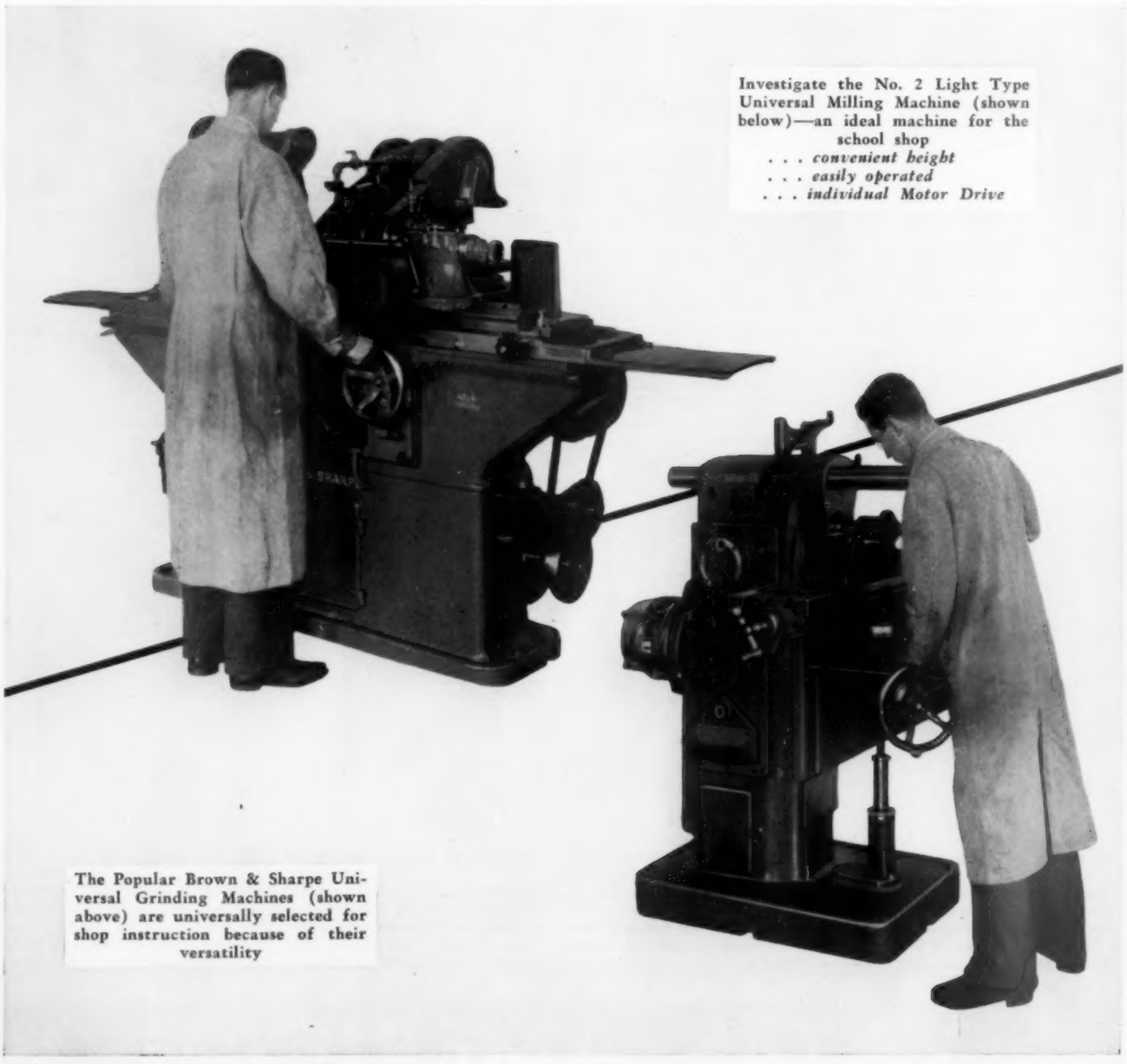
SCREW MACHINES

Automatic and Wire Feed (Semi-Automatic)

MILLING MACHINES

Universal — Plain — Vertical, including toolroom and manufacturing types.

Detailed Specifications of any size or type of machine gladly sent on request



Investigate the No. 2 Light Type Universal Milling Machine (shown below)—an ideal machine for the school shop
. . . convenient height
. . . easily operated
. . . individual Motor Drive

The Popular Brown & Sharpe Universal Grinding Machines (shown above) are universally selected for shop instruction because of their versatility

MACHINISTS' TOOLS

Micrometers — Calipers
Verniers — Gages
Indicators

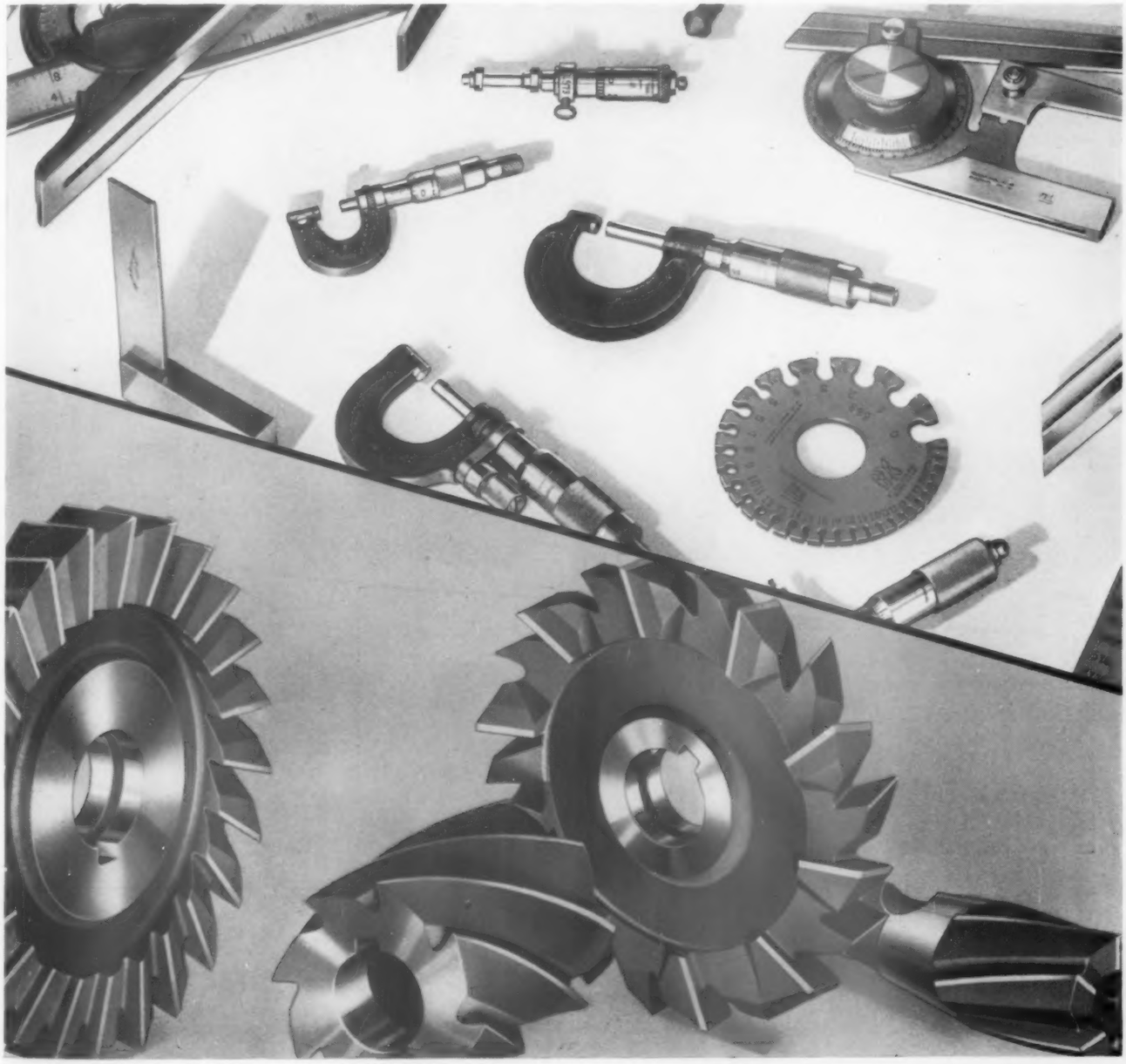
MILLING CUTTERS

Plain Milling Cutters
End Mills
Face Mills
Slitting Saws
Gear Cutters
Hobs

MISCELLANEOUS SHOP EQUIPMENT

Arbors and Collets
Ground Flat Stock
Surface Plates
Magnetic Chucks
Vises
Pumps

Catalog of complete line on request



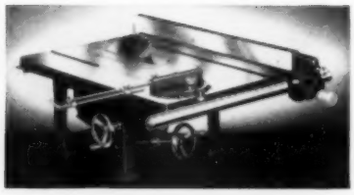
BOICE-CRANE COMPANY

1726–34 Norwood Avenue
Toledo, Ohio

For the School Shop

BOICE-CRANE

SAWS
LATHES
SHAPERS
SANDERS
JIG SAWS
JOINTERS
BAND SAWS
DRILL PRESSES
THICKNESS PLANERS



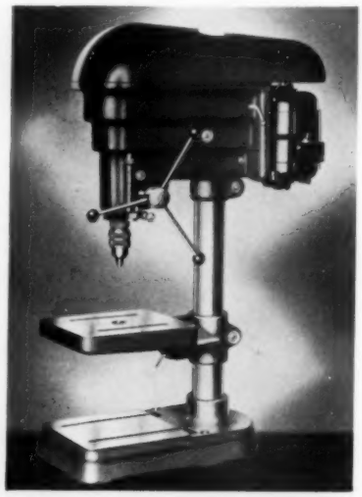
TILTING ARBOR SAW
No. 2500

Nine years ago Boice-Crane announced the first low-cost Tilting Arbor Saw, with big oversize ball bearings and oversize diameter saw arbor, to stand punishing service sawing with big 10-inch blades. Every year since, improvements have been added; **in 1939, the one-knob fence control** with three distinct functions: 1st, position of knob for alignment and micro-set; 2d, for rapid traverse; 3d, to lock fence in a positively slip-proof bulldog grip.

The Boice-Crane Rolling Pulley Drive still outperforms others and saves you cost and upkeep. Driven by any motor ⅓ to 2 horsepower.

"HELMET HEAD" DRILL
No. 2600

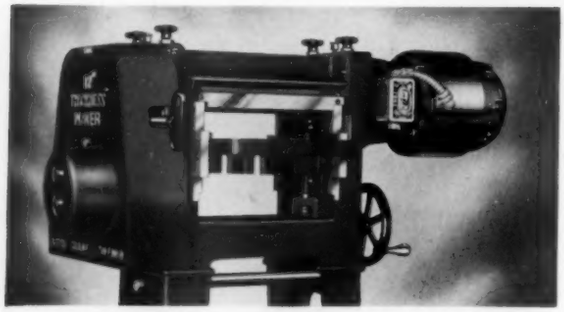
Nowhere else can you find a medium-priced drill press with such massiveness in the drill-head—such large oversize quill and bearings. In no other drill do you find our self-centering, involute, six-splined spindle for greater power transmission and for proven longer life, or a built-in Helmet Guard for your complete operating safety. The Helmet Head banishes the danger line by enclosing every moving part (belt, both pulleys, and motor-end) but swings open on its 12-inch-long hinge for lightning-quick full access to parts to make a belt or speed change.



SIX-INCH JOINTER
No. 1400

When you buy any 6-inch jointer, you do so primarily because you want to joint long stock, and you therefore need long tables. However, long tables alone are not enough. Fully 90% of your jointing must be fence guided, consequently it is fully as important to purchase a jointer with a long, rigid fence as one with long tables. Boice-Crane's 6-inch Jointer embodies both of these important features: longer and more rigid double-locked fence, as well as longer tables. Tables average a full five inches longer than others; the Boice-Crane fence, a good ten inches longer.

Another feature is the 3-inch diameter cutterhead—the largest found in any low-priced 6-inch jointer.



THICKNESS PLANER
No. 1000

Here is another dollar-saving, cost-reducing machine, used by many plants for all their planing; by others, to keep light jobs off the big machines. An admirable choice for the school shop, meeting all requirements at low cost. Try it on hardwood or soft—on short stock or long—on thick stock or extremely thin—on heavy cut or light—on dressed stock or rough-sawed. Whatever it is you wish to plane, a Boice-Crane will do it, speedily, and well.

SPINDLE SHAPER
Floor Type
No. 2100

Scientifically designed for faster, heavier cuts, the Boice-Crane Spindle Shaper has what it takes — balance, power, dead true solid one-piece spindle, in a massive housing and with two oversize life-lubricated ball bearings. The Spindle stays true after years of terrific pounding from running wide, deep cuts at production speed. It's powerful. It saves time and cuts costs. Dual-spindle accommodates both ½-inch bore low-priced cutters and ¾-inch bore heavier cutters.

Send for 1939 CATALOG
showing our complete line
—21 machines—11 types.

DELTA MANUFACTURING COMPANY

612 E. Vienna Avenue

Milwaukee, Wis.

Adapted as Standard Equipment by Hundreds of Leading Schools and Colleges

More and more, modern school shops are being equipped with "low cost" light power tools such as Delta makes. Every educator concerned with vocational and technical training should be fully acquainted with this new trend in shop equipment. The arguments for these new type tools are overwhelming. Consider them:

1. Low First Cost — From one-third to one-tenth of heavier equipment.

2. Low Maintenance Cost — A fraction of that of heavy machines.

3. Compactness and Flexibility— They occupy less space and can be adapted to fit the needs of any school shop.

4. Splendid Safety Features — Delta light power tools are provided with safety guards that meet the strictest requirements.

5. Maximum "After Graduation" Value—Delta tools are used by thousands of industrial plants from the largest to the smallest—by hundreds of thousands of home workshop owners. Students are thus trained to use tools that they will operate when school days are over.

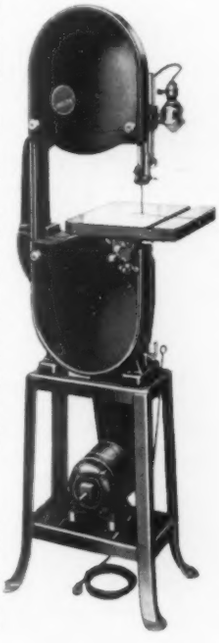
New DELTA TILTING ARBOR SAW

The latest of the complete line of Delta circular saws perfected after seven years of patient testing and experimenting—the new Delta Tilting Arbor Saw is the ideal circular saw for schools. Some of its outstanding points are: Powerful fully enclosed motor; highly efficient "Tex-Rope" drive; perfected raising, lowering and tilting mechanism; new scientifically designed rigid housing; patented double-face, double-lock rip gauge; exclusive precision auto-set miter gauge; patented ripping extensions; sealed-for-life ball bearings; forged alloy-steel arbor; extra large table; "Point-of-use" controls and numerous other features.

DRILL PRESSES

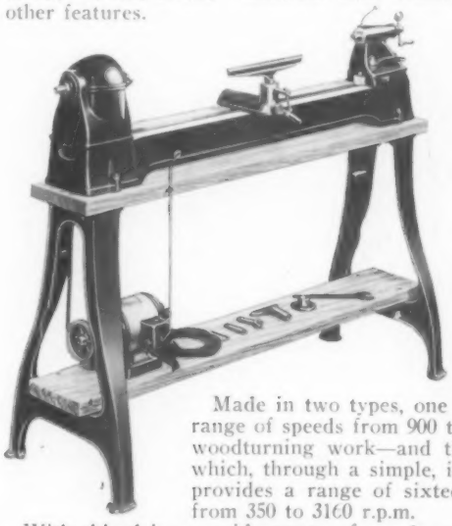
Delta offers a complete line of low cost Drill Presses including 11", 14" and 17" bench and floor-type models for both wood and metal work.

In the school shop, they offer the advantages of low first cost, low maintenance and power cost, portability and adaptability. They can be used for drilling and boring in metal or wood, for shaping, routing, surface grinding, mortising and sanding, and the design of the interchangeable spindles insures minimum overhang under the quill bearings, and thus better work.



BAND SAWS

10" and 14" wood-cutting band saws and a 14" metal-cutting band saw are in the Delta line. They offer numerous special features and exclusive improvements that make them ideal for school shops.



LATHES

When you want to equip a school shop to handle more pupils at less cost, you get more for your money in fine Delta lathe units.

Made in two types, one a four-speed unit providing a range of speeds from 900 to 3400 r.p.m.—sufficient for all woodturning work—and the other a sixteen-speed unit which, through a simple, inexpensive countershaft drive, provides a range of sixteen speeds carefully graduated from 350 to 3100 r.p.m.

With this drive, a wide range of work can be done in metal as well as in wood.

Complete DELTA Line

includes Scroll Saws, Shapers, Grinders, Circular Saws, Band Saws, Jointers, Motors, Lathes—everything for the school. Send for latest catalog giving descriptions, prices and information on school installations.

OLIVER MACHINERY COMPANY

Grand Rapids, Mich.

BRANCH OFFICES

50 Church Street, New York City
1450 N. Monitor Avenue, Chicago
901 Bank of Commerce Building, St. Louis
221 Sexton Building, Minneapolis

METAL SPINNING DEVELOPING RAPIDLY

It is easy to learn and the art possibilities are unlimited. Ask Oliver about Metal Spinning.

Metal Spinning Lathes by Oliver have been developed to the point of Leadership in this line. Lathes are powerful. Boys love the work. Lathes can be used for wood turning also.

"OLIVER" OILSTONE TOOL GRINDERS

Junior with 6" Wheels

Every shop using edge tools should have an Oilstone Grinder.

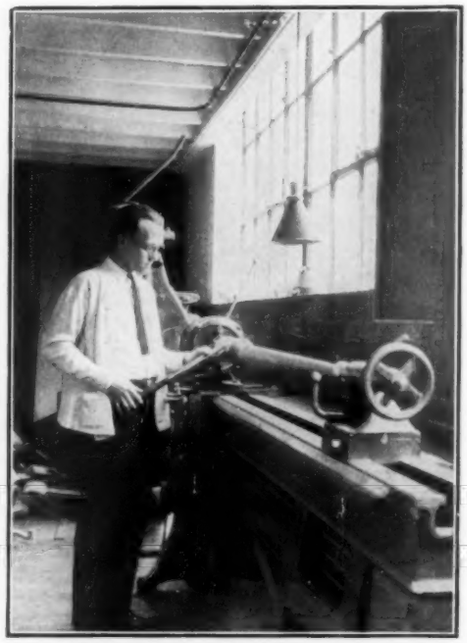
No. 585, illustrated at right, carries two 8" Oilstone wheels, a dry grinding wheel and emery cone.

"OLIVER" CIRCULAR SAWING MACHINERY

Variety Saw Bench

Built in sizes from large heavy saws to junior models. The variety saw, No. 32, as illustrated, carries a 12" saw and is built with tilting saw or tilting table. It is a very popular size.

Important Note: It is impossible with so large a line as the "Oliver" to put specifications into such a small space. We will gladly send to inquirers specifications and literature fully describing any machines in our line.

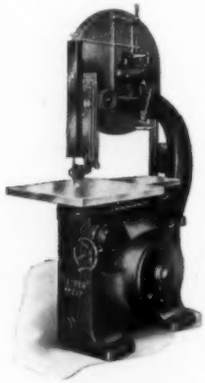


"OLIVER" SPEED LATHE

Western State Normal—Kalamazoo, Michigan. Installed in 1923. Long enough to know how good it is. Write them for opinion. "Oliver" Woodworking Machines are built for a long life.

"OLIVER" WOOD LATHES

are built in many types and sizes from largest pattern makers lathes to junior sizes. No. 51, illustrated at right, is a 12" motor head speed lathe giving all speeds from 600 to 3600 r.p.m.



"OLIVER" BAND SAWS

Full line from largest high speed band saws to 18" Junior. We illustrate our popular 30-inch, No. 217.

No. 299 Surfacer is illustrated at right.

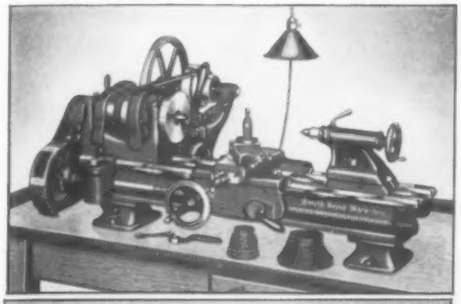
Ask for Details and Prices on "Oliver"

Circular Saw Benches	Sanders (Specify Type)
Band Saws	Boring Machines
Band Saw Brazers	Mortisers
Jig Saws	Tenoners
Surface Planers	Shapers
Jointers	Wood Trimmers
Electric Glue Pots	Oilstone Tool Grinders
Wood Lathes	Woodworkers Vises

SOUTH BEND LATHE WORKS

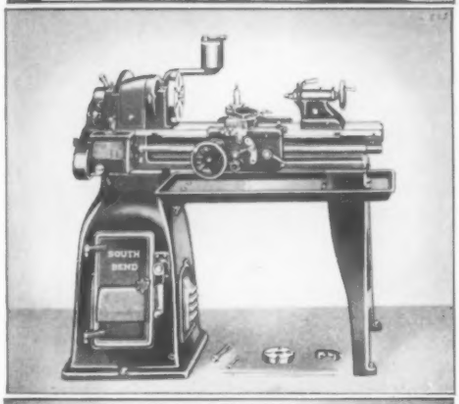
473 East Madison St., South Bend, Ind., U. S. A.

Manufacturers of South Bend, Back-Geared, Screw-Cutting, Precision Lathes; 68 sizes and types of Quick Change Gear and Standard Change Gear Lathes; 9″, 11″, 13″, 14½″ and 16″ swing; 3′ to 12′ bed lengths; Metal Working Precision Lathe Manufacturers for 32 Years

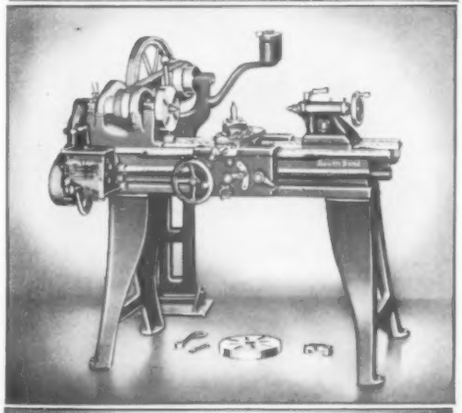


No. 415-YA, 9″ x 3′ South Bend Workshop Back-Geared, Screw-Cutting, Precision Bench Lathe, less Motor Drive. **$85.00**

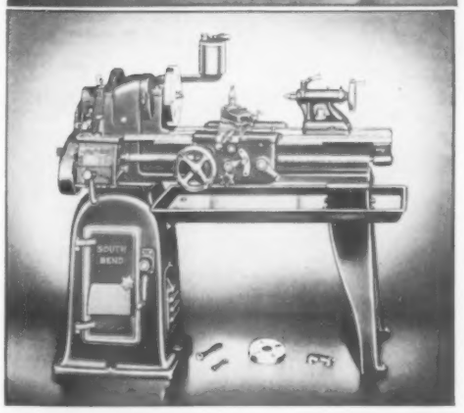
Horizontal Adjustable Countershaft Drive, ¼ H.P. Reversing Motor, Switch, and belts, As shown, less bench. Wt. 320 lbs. **$117.00**



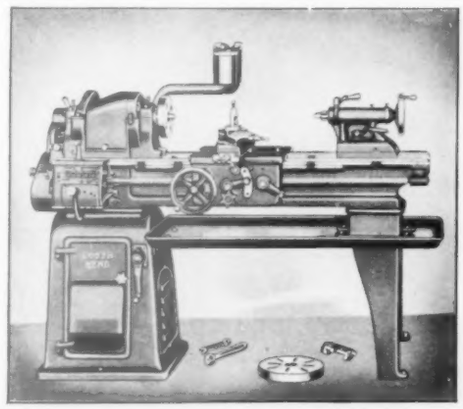
No. 109-Y, 9″ x 3′ Quick Change Gear, Underneath Belt Motor Driven Precision Lathe with ½ H.P. Instant Reversing Motor, Chip Pan, and electrical equipment, as shown. Wt. 815 lbs. **$470.00**



No. 911-A, 11″ x 4′ Quick Change Gear, Pedestal Adjustable Motor Driven Precision Lathe with ½ H.P. Instant Reversing Motor, and electrical equipment, as shown. Wt. 863 lbs. **$528.00**



No. 111-A, 11″ x 4′ Quick Change Gear, Underneath Belt Motor Driven Precision Lathe with ½ H.P. Instant Reversing Motor, Chip Pan, and electrical equipment, as shown. Wt. 980 lbs. **$612.00**



No. 113-B 13″ x 5′ Quick Change Gear, Underneath Belt Motor Driven Precision Lathe with ¾ H.P. Instant Reversing Motor, Chip Pan, and electrical equipment, as shown. Wt. 1560 lbs. **$759.00**

6 INSTRUCTIVE BOOKS with Machine Shop Information

Vocational training for all classes of school shops is shown in these books—Floor plans, projects, types of work, equipment recommended, estimated cost, etc., for the large and small General Shop, the Farm Mechanics Shop, the Vocational Machine Shop, the Motor Mechanics School Shop, Senior and Junior High School Machine Shop, the Technical and Trade School Machine Shop.

School officials, Supervisors and Instructors interested in modern vocational training can have these books sent free of charge postpaid, without obligation, by writing this Company.

Modern School Shops—Containing 32 actual views of outstanding school machine shops in the U. S.

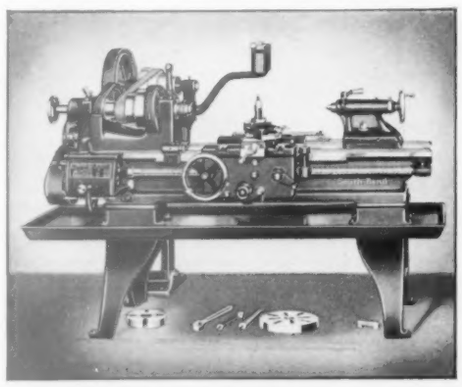
The School Shop—Contains floor plans, equipment costs, types of work for all classes of school shops.

Farm Mechanics in the School Shop—32 pages of authoritative Farm Mechanics Instruction showing floor plans, projects, equipment, Shop Courses, and other useful information.

South Bend Machine Shop Course—Shows 55 projects based on production methods in building machinery. Used in 10,000 schools.

How to Run a Lathe—128 pages with instruction in every type of lathe operation. Over 350 illustrations.

Catalog No. 98—Shows South Bend Lathes in 9″, 11″, 13″, 14½″ and 16″ swing; bed lengths 3′ to 12′, Motor Drive and Countershaft drive.



No. 8983-C, 14½″ x 6′ Tool Room Pedestal Adjustable Motor Drive, Quick Change Gear Precision Lathe with 1 H.P. Instant Reversing Motor, Chip Pan, Draw-in Collet Chuck, Taper Attachment, Thread Indicator, Carriage Stop, and electrical equipment, as shown. Wt. 2020 lbs. **$1,041.00**

THE PECK, STOW & WILCOX COMPANY

SINCE 1785

PEXTO Southington Connecticut PEXTO

SHEET METAL WORKING

The Ideal School Shop Course

- PRACTICAL INSTRUCTION in one of industry's increasingly important trades.
- IMMEDIATE APPLICATION of class work in mechanical drawing to actual shop practice.
- DEVELOPS SKILL in the use of many different types of hand tools and machines.
- INEXPENSIVE SHOP EQUIPMENT and low-cost materials.
- SUSTAINED INTEREST of students in designing and making products of practical value in home and industry.

Properly planned sheet metal working courses offer students broad, practical instruction in work with metals, in the making of shop drawings and patterns and in the use of a great variety of hand tools. Yet the investment cost for equipment is lower than for many other mechanical courses and work materials are very inexpensive.

No. 137
Squaring Shear

In equipping your sheet metal working shop you want your students to have the great advantage of working with well-known standard equipment . . . identical in design and operation with equipment used in commercial sheet metal shops throughout industry. Pexto machines and tools have been first choice of experienced sheet metal workers for more than 100 years.

Equally important to you in planning a new or expanded sheet metal department is the fact that Pexto has had long and successful experience in working with trade and vocational schools throughout the country.

You can furnish your shop complete in every detail from this one reliable source, secure in the knowledge that your classes will obtain latest approved designs in the rapidly growing sheet metal field. Send us an outline of your plans and available facilities. Let us show you how much can be done on a limited appropriation in training students for one of Industry's most interesting and promising fields.

The PEXTO Line is Complete

Squaring Shears
Slitting Shears
Ring and Circle Shears
Scroll Shears
Punch Presses
Folders and Brakes
Wiring, Burring, Setting Down, Turning, Beading, Elbow Edging, Crimping and Seam-Closing Machines
Formers
Groovers
Stakes
Bench Plates
Hand Tools
Gas Furnaces

SCHOOL SHOP PLAN BOOK
Sent Free on Request

An invaluable aid to instructor and student alike. Illustrates the essential equipment and tool items and describes their use. Contains equipment lists and typical shop layout plan. Specially prepared for the use of trade vocational schools. Bulletin No. SB-35.

No. 1544
Combination Machine and set of rolls

No. 0581
Combination Crimper and Beader

No. 622
Deep Throat Combination Machine

No. 381
Slip Roll Former

No. 63
Adjustable Bar Folder with counter balance

SCHOOL LAYOUTS BY ATF

WHY TEACH PRINTING?

- The educational value of printing as a school subject is far greater than the technical knowledge it imparts.
- Unlike other manual studies, printing affects the lives of all of us. It becomes a part of school life as completely as it does of community life.
- Printing interprets aims and ideals of your school to the community and is a powerful force at your command for winning public support for your educational program.
- As one of the fine arts, printing fosters an appreciation of all the arts, and is rich in the finest cultural influences.
- A potent influence for leadership, printing teaches accuracy, neatness, orderly thinking, honesty and truthfulness. It arouses civic pride and interest, and develops a sense of cooperative values.
- Printing provides the opportunity to "learn by doing," which is the goal of most present-day teaching.
- Printing brings the student into close contact with his other studies—English, History, Geography, Mathematics and Art—widening his field of knowledge and sharpening his mental faculties.
- Printing is often called "Mother of Progress," and without it knowledge as we know it today would not exist. As such it is an integral part of our educational system, and no school can afford to be without it.
- Have you a copy of "Why Teach Printing?" Then by all means send for it today. It's free!

ATF has devoted 45 years exclusively to the service of school printing plants, and the development and building of printing equipment. A competent staff of engineers is available to assist in the planning of your department... advise in the selection of units best suited to your needs... help you in solving any difficulties in the layout or organization of your printshop.

On the following pages are three specimen layouts as examples of ATF's *free* Engineering Service to schools. Don't expect to find the answer to your particular problem here... due to lack of space we are able to show only a few of the many layouts we are prepared to furnish. In all school printshop layouts, due consideration is given the problem of safety first, lighting of the room, and convenient, easy routing of materials.

Feel free to call on us for whatever information or suggestions you need. You are welcome to this service without obligation, of course. Simply fill in, sign and send the prepaid postal card that is provided for your convenience on page three.

THE BEST TYPE MADE

Wherever the printed word appears, you are sure to find American types in those readable, usable faces that lend distinction to much of the everyday printing. Nearly a century of experience and the finest materials and workmanship are united in the manufacture of American types. Every school printshop deserves the best, which is truly American.

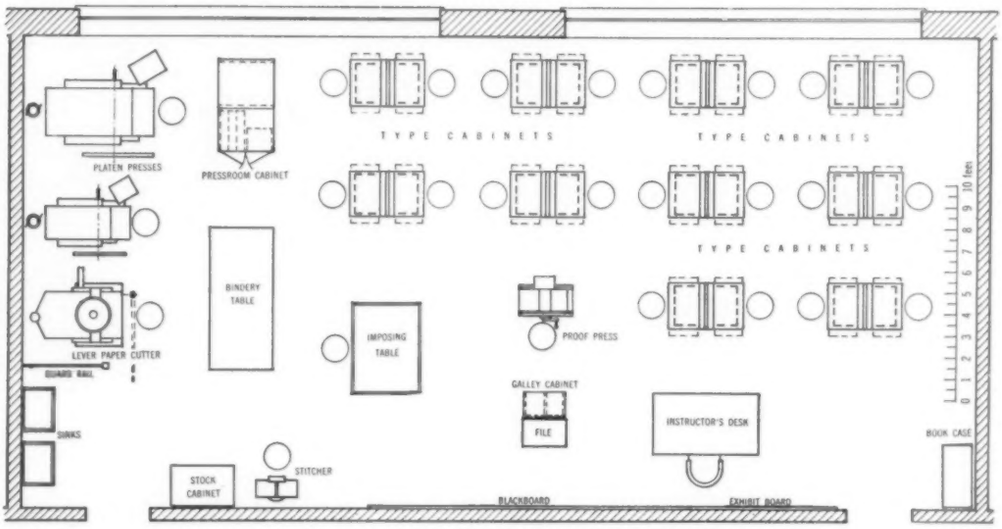
The Handy Index of American types will easily and quickly familiarize even the beginner with the modern, as well as time-tested faces. Over 200 type faces grouped by style characteristics, width and height, with a convenient pica measure on every page. Cross-indexed for ready reference. A copy is yours for the asking. Use prepaid postal card provided on page three.

AMERICAN TYPE FOUNDERS

Department of Education • 200 ELMORA AVENUE, ELIZABETH, N. J.

Junior High School

The ideal layout for Junior High School printing unit to take care of 20-23 pupils. Approximate room size, 22x45 feet.



Complete printshop training includes all essential operations—from setting of type, through printing, to cutting and binding. We show on these pages only a few pieces of the large assortment of equipment we carry for the school printshop. A complete listing and full description of all ATF school printshop equipment will be sent upon request. Use the prepaid postal card on next page.

SCHOOL BY

Challenge Lever Paper Cutter

Scientifically designed, yet simply constructed. No. 265 *Challenge* is safe, easy to operate, and thoroughly dependable.

American Ideal School Type Cabinet

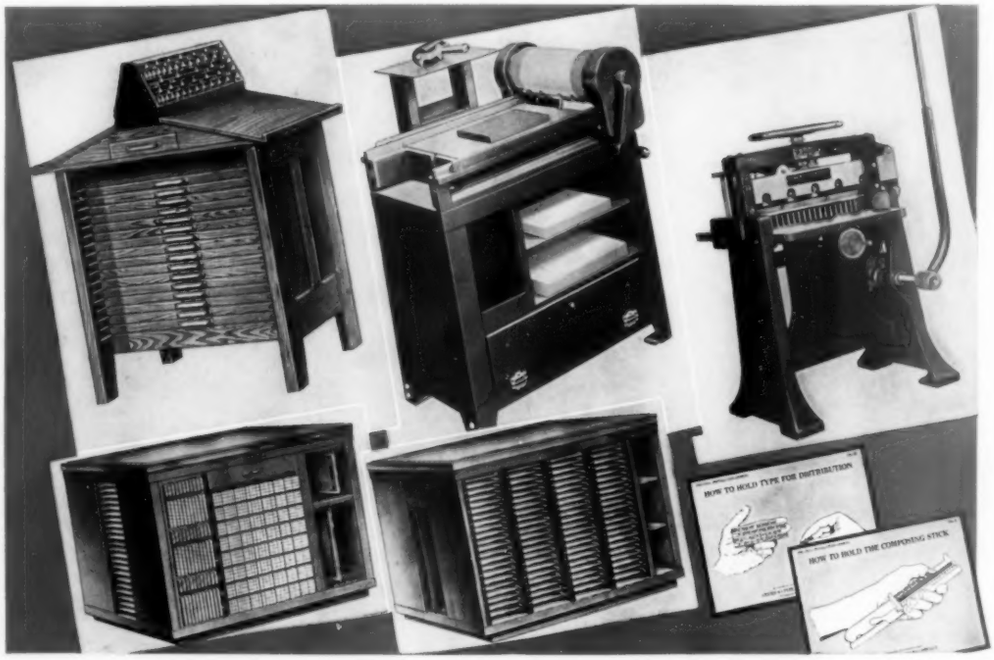
Specially designed and constructed for school use. Two students can set type at the same time at this cabinet. Complete with job and font cases, lead and slug rack. Substantially built of seasoned hardwood, flat varnish finish.

No. 1 Vandercook Proof Press

Accurate, rigid and accessible, this is an ideal machine for all hand inking work on 14x18 inch printing surface. Suitable for either Junior or Senior High Schools. (See opposite layout.)

American School Imposing Table

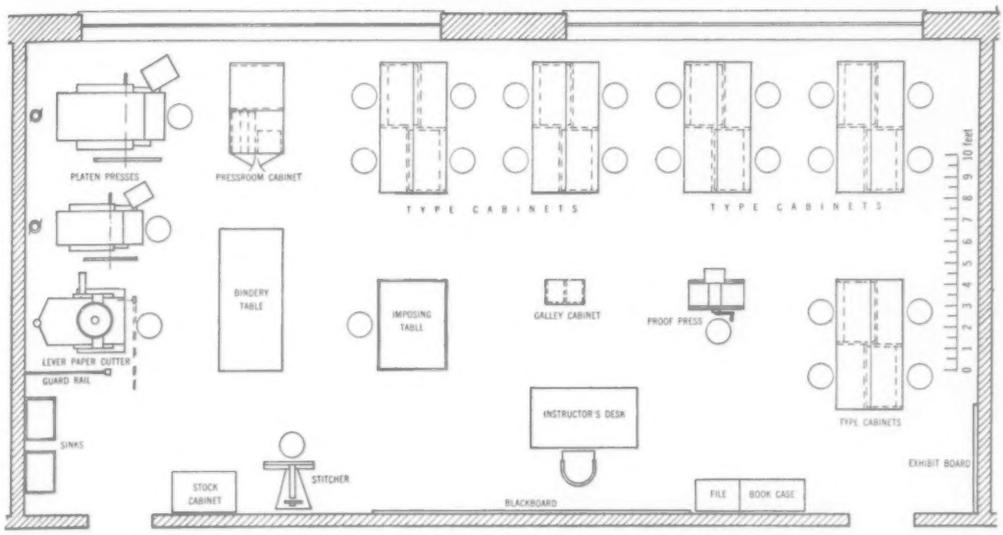
Ideal in size and design for both Junior and Senior High Schools. Illustrated above are both sides and ends of the 51x39 inch table.



Visual Aids

Twenty-four wall charts illustrating proper methods of performing the basic operations in printing. Facilitate training and eliminate the need for distracting repetition of instruction. Printed on 10-ply cardboard, 11x14 inches, suitable for hanging on the wall. Only $2 for the set of 24. Ask your purchasing department to order direct from nearest ATF Branch Office.

Feel free to call on us for whatever information you may need — whether it relates to the small GENERAL SHOP UNIT or to the large Vocational Training Unit. You are welcome to this service by ATF's Education and Engineering Service. Simply fill in and mail the prepaid postal card provided for your convenience on next page.



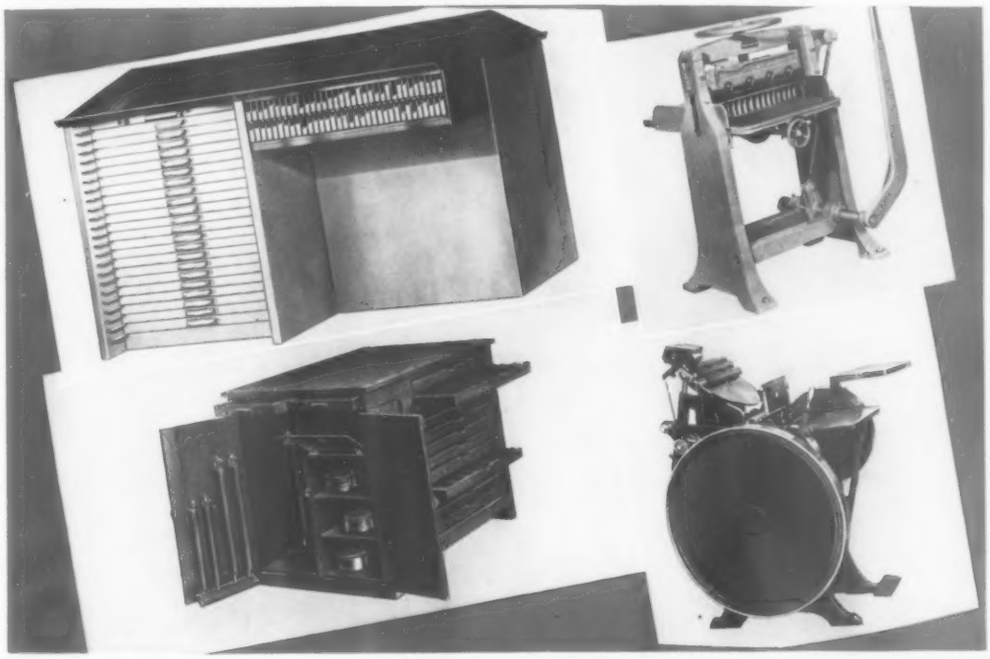
Senior High School

The ideal layout for Senior High School printing unit to take care of 20-23 pupils. Approximate room size, 22x45 feet.

LAYOUTS ATF

The same engineers who have laid out many of the leading commercial plants in the country are at your disposal in laying out, or enlarging, your school printshop. Don't hesitate to avail yourself of this service. There is absolutely no cost or obligation involved. Our educational service covers the entire range of printing departments from the smallest general shop unit to the trade training shop.

TEACH PRINTING
A PUBLICITY MEDIUM UNDER SCHOOL CONTROL



New Series C & P Platen Press

In three sizes—8x12, 10x15, 12x18—suitable for either Junior or Senior High Schools. Capable of as much as 2700 impressions per hour, yet easily moderated to fit the pace of slower students.

School Pressroom Cabinet

A combination cabinet and stock table with ink, rag, roller compartments and drying rack.

C & P Buckeye Lever Paper Cutter

Popular new 26½-inch lever paper cutter, modern in design, vitally improved in operating efficiency.

Standard School Type Cabinet

For high schools and colleges. Accommodates four students, two on each side. Substantial steel construction, olive green baked enamel finish.

23 convenient Branch Offices ready to serve you in

ATLANTA, GA. • BALTIMORE, MD. • BOSTON, MASS. • BUFFALO, N.Y. • CHICAGO, ILL. CINCINNATI, OHIO • CLEVELAND, OHIO • DALLAS, TEXAS • DENVER, COLORADO DES MOINES, IOWA • DETROIT, MICHIGAN • KANSAS CITY, MO. • LOS ANGELES, CAL. MILWAUKEE, WIS. • MINNEAPOLIS, MINN. • NEW YORK, N.Y. • PHILADELPHIA, PA. PITTSBURGH, PENNSYLVANIA • PORTLAND, OREGON • ST. LOUIS, MISSOURI • SAN FRANCISCO, CALIFORNIA • SEATTLE, WASHINGTON • WASHINGTON, D. C.

AMERICAN TYPE FOUNDERS • *Department of Education*

Kindly send me information relative to Printing Equipment and Supplies needed in (check one):

☐ General Shop Unit
☐ Junior High School
☐ Senior High School
☐ Vocational School

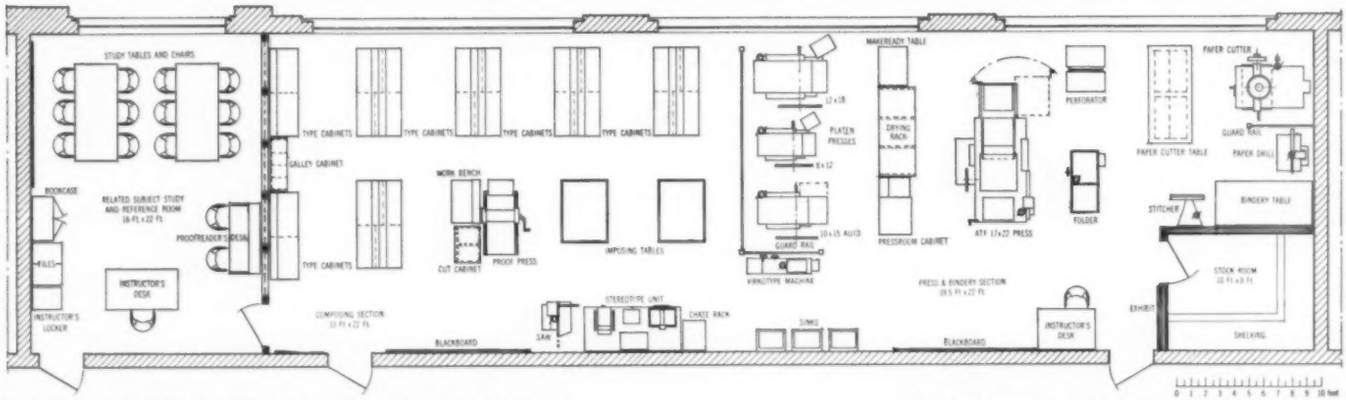
To accommodate_____ pupils at a time.
Size of room available_____ by_____.
Interested in an ideal setup. ☐
Appropriation limited to $_____

Name_____

Position_____

School_____

City_____ State_____



VOCATIONAL PRINTING UNIT SUGGESTED LAYOUT, 24-32 PUPILS

The ideal layout for trade training classes to take care of 24 to 32 pupils. Approximate room size, 22x72 feet.

Trade

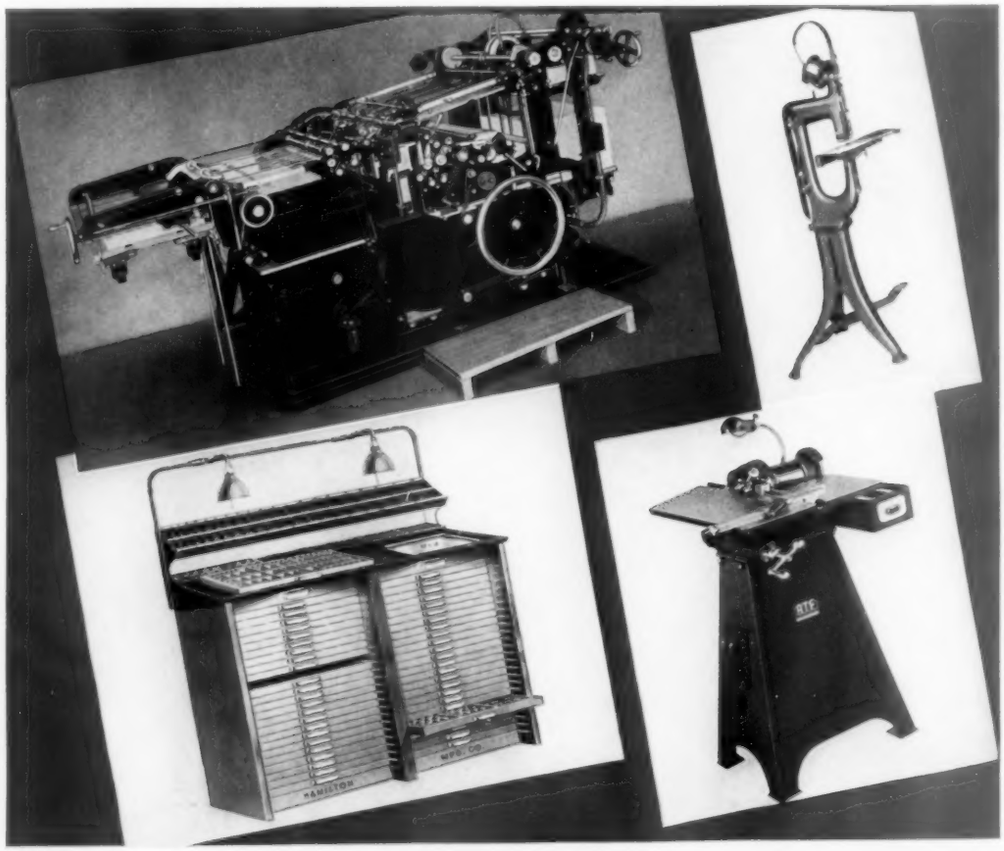
Training Classes

Double-Tier Wall Type Cabinet

Easy access to all compartments of type cases. Large working surface that takes full-size working galleys. All-steel construction, olive green baked enamel finish.

ATF Composing Room Saw

For heavy duty, as well as all light work encountered in trade training classes. Newest safety and economy features.



New ATF 17x22 Kelly Automatic Press

The most economical, efficient flat-bed cylinder press for the training of trade school pupils. The press that is found in so many commercial printing plants throughout the country today.

Boston Wire Stitcher

Easily arranged for saddle or flat stitching and operated by foot pedal up to ½ inch thickness. Its speed is equal to the operator. Also power stitchers in all sizes.

Types used: Lydian, Bernhard Gothics, Raleigh Gothic Condensed, members of Bodoni family, Alternate Gothics. Printed on Kelly Presses with ATF Non-Offset Guns 9-38

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 409, Sec. 510 P. L. & R., Elizabeth, N. J.

American Type Founders

200 Elmora Avenue

Dept. of Education *Elizabeth, N. J.*

THE NEW BRITAIN MACHINE CO.

New Britain, Conn.

"NEW BRITAIN" "NONE BETTER"

Shop Equipment and Tools

Industrial Arts Locker Bench

"NONE BETTER" SHOP EQUIPMENT

The New Britain Line of Steel Shop Equipment was designed by "New Britain" Engineers, to meet increasing demands for durable, splinter-proof, fire-proof shop benches. The understructure of every "New Britain" bench, is of **all steel,** arc-welded, or electric spot welded, construction. Handsome in appearance, easily cleaned, with dust-proof legs and feet, solid, rugged, durable to an extreme, "New Britain" equipment will outwear and outlast by many years, inferior wooden construction with creaky joints, wobbly supports, and ugly design. Send for our Catalog 707-SE containing details of machinists' benches, sheet metal work benches, glue and stain benches, welding benches of every character, cabinet and locker benches, art and drawing tables, etc., etc.

"NONE BETTER" TOOLS

One of many "None Better" tool sets that have been arranged to meet varied requirements. If you need a small set with a few tools or any other combination up to the No. 6000 with 140 pieces you will find just the size and type you want in the No. 39 Catalog. These sets have been arranged after a careful study of the mechanics needs. They are packed in appropriate boxes, provided with leather carrying handles where needed. The larger sets like the No. 6000 are too heavy to be readily carried, and for these we recommend the "None Better" Portable Cabinets. These cabinets provide a place for the tool set and ample room for any and all other tools that may be required. They are mounted on free rolling casters and a complete tool equipment can be easily rolled to the job. The No. 6000 tool chest is equipped with padlock hasp to take any standard lock and the door of the Senior Cabinet has a good quality lock giving complete protection to the contents. None Better Tools are made from the highest grade chrome alloy steel by trained mechanics and are correct in weight, style and balance. They are also attractively finished in triple Chromium plate.

Our No. 39 Catalog gives full information about **"None Better" Tools.** Write for your copy.

SEND FOR OUR NEW ILLUSTRATED CATALOG NO. 707-SE FOR FULL DETAILS

Cabinet Bench No. 9502

Locker Work Bench

Wrench Set No. 6000

THE AMERICAN SCHOOL AND UNIVERSITY

WICKES BROTHERS

Manufacturers of

Continuous Electric Blue Printing Machines

Saginaw, Mich.

Established 1854

Make Low Cost BLUE PRINTS

in your own shops

SPEEDY SIMPLEX MACHINE CUTS BLUEPRINT COSTS

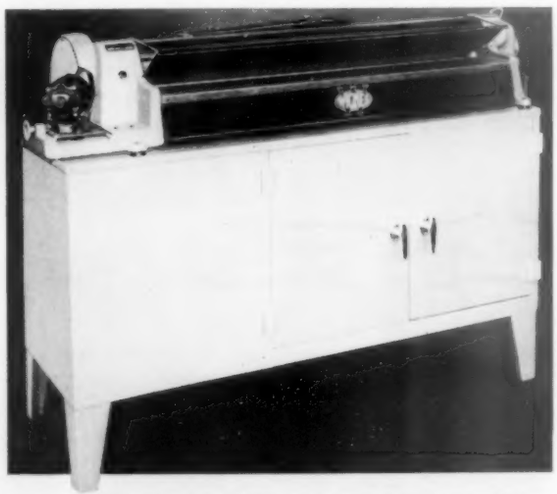
Here's the machine you've been looking for! A practical portable blueprinter that produces regulation blueprints up to 42″ wide in less than 3 minutes. Its vapor-tube lamp heats up in 55 seconds. It operates for a fraction of the cost of operating other type machines. It makes no faint or streaky prints. All the way around it's handy, compact and fool-proof.

HERE'S WHAT *this little machine will do:*

1. Make prints from single sheets or continuous rolls (up to 42″ wide).
2. Prints paper from blueprints or Van Dykes.
3. Prints paper for special developing processes such as: Ozalid, Maroon, Black and White, etc.
4. Will produce up to 250 square feet per hour.
5. Makes even, sharp, clear prints of any type.

The Wickes Simplex Printer is complete—ready to plug in (no special wiring necessary). It is equipped for any usual type of electrical current. Ask for prices and facts about special trial offer.

HANDY SIMPLEX CABINET. Here is just the cabinet you'll want for your Wickes Simplex Blueprinter. Has plenty of room for your blueprints. Has light-proof doors. Rigidly built of 20-gauge auto-body steel. Aluminum finish.



A SIMPLEX MAKES YOUR OWN BLUEPRINTS AT VERY LOW COST.

★ ★ ★

SECTION XII
TRANSPORTATION SERVICE

PROBLEMS INVOLVED IN PROVIDING EFFICIENT SCHOOL TRANSPORTATION SERVICE

By EDGAR L. MORPHET

Director of Administration and Finance, State Department of Public Instruction, Tallahassee, Fla.

What Is Efficient Transportation Service?

BEFORE attempting to discuss problems involved in providing efficient transportation service, it would seem logical to consider what is implied by the term "efficient." This term is often interpreted from a narrow point of view. For example, efficiency may be judged purely in terms of economy in costs of operation, if that is accepted as the desired result and if efficiency is defined as anything "capable of producing a desired result."

Transportation service, however, must be considered in its relationship to the school program and to the child being transported. If that point of view is accepted, efficient transportation service must be interpreted as capable of producing the following desired results:

Safety.—Any transportation service that is efficient must, above all, provide for safe travel for all pupils. Of course, travel hazards cannot be eliminated entirely. However, they can and must be reduced to a minimum. Safe transportation service must provide reasonable freedom from all types of physical hazards which may cause accidents; from health hazards which might jeopardize the well-being or even the life of a child; and from moral hazards.

Reliability.—Transportation service must be depended upon by parents, pupils and the school to be regular; that is, to pick the children up at designated stops and times indicated and to deliver them at school according to schedule. Children should never have to wait because the bus is late, or run the risk of missing the bus because it is early. It must also deliver the children at the school at the designated time. Arrival at school ahead of schedule may have as many unfortunate results as arrival after the school program has begun.

Reasonable Comfort.—Children cannot arrive at school in condition to participate efficiently in the day's program if the bus trip is too uncomfortable. If seats are not properly padded,—and there are still buses with wooden seats operating in many sections of the country,—if the springs are not adjusted to the load to be carried, if the road is so rough or the trip is so long that children are needlessly tired, or if the bus is too crowded or is improperly heated in cold weather, the transportation service cannot be considered efficient. However, this standard of reasonable comfort does not justify an unusual outlay of funds to provide luxurious equipment. Reasonable comfort can usually be provided within the limits of funds available.

Minimum Cost.—Provision of transportation service with a minimum of cost is frequently put first in a list of desired results. Extreme economy, however, is not the main desired result. The factors listed above as relating directly to the welfare of the child and of the school program must necessarily be considered the basic factors. Unless assurance can be given that at least reasonable minimum standards can be met in these other respects, it is doubtful whether the attempt to transport children should be made. When reasonable minimum standards are established and met, however, it is obvious that transportation service should be operated with a maximum of economy.

Transportation Equipment as Related to Efficient Service

Satisfactory transportation equipment does not insure efficient service. It is, however, basic to efficient service, and perhaps from that point of view should be given priority in discussion. Minimum standards

for equipment must be established before safety, reliability, comfort, or even real economy can be assured. School transportation has developed so rapidly in this country, however, that school officials have been too involved in meeting necessities to have much opportunity to develop adequate minimum standards.

Most school officials of today can remember the time when practically all transportation equipment was horse-drawn. Minimum standards in those days stressed vehicles that would carry the load without breaking down, and horses that had a reasonable amount of gentleness combined with a certain amount of speed and endurance. Of course, in northern climates thought had to be given to shelter from bad weather. Standards for heating were thought of in terms of heavy robes and warmed bricks.

As motor transportation has developed, the need for definite minimum standards has become obvious. In the first place, the lives, welfare, and comfort of more children are at stake each year. In the second place, the speed with which motor vehicles are operating necessarily involves greater potential hazards. If an axle broke in the days of horse-drawn vehicles, there might have been a few bruises but probably no serious injuries unless the horses ran away. If an axle breaks in a bus that is traveling 30 or 35 miles an hour, however, the results are likely to be disastrous.

The first steps toward setting up minimum standards were logically taken by officials of some of the local school administrative units, rather than by states. A few outstanding districts and counties made remarkable progress and set up standards that were fairly adequate. Many other school units did nothing. They accepted the standards set by the salesmen, with results that were sometimes most unfortunate.

During recent years, many states have seen the need for providing minimum standards for equipment as well as for other phases of transportation service which are applicable on a state-wide basis. Some of these standards unfortunately had to come largely as an outgrowth of disastrous accidents and of the resulting demand for greater protection for the children. Such a situation led Florida to provide by State Board regulation that all school bus bodies purchased after that date must be of all-steel or an equivalent of all-steel construction.

Strength.—One of the basic problems in setting standards for school transportation equipment is to assure strength without too much weight. Experience involving many major accidents has proved that the wooden body should be ruled out completely. While it is light, it does not provide the strength required. Most so-called "steel reinforced bodies" are likewise entirely inadequate, unless perhaps for service on remote country roads where there is little other traffic.

The left front corner is one of the most vulnerable parts in the bus because of the danger and the disastrous results from collisions. Rectangular construction was ruled out several years ago because of the hazard offered by the right angle at the left front corner. A rounded corner or a corner that offers more than a right angle is more likely to aid in warding off the direct impact of blows that come from collisions.

Some of the earlier all-steel bus bodies were entirely too heavy and clumsy. Moreover, the fact that a body is all-steel does not mean that it has the required strength. Some all-steel construction may be nearly as vulnerable as a body constructed with steel supports. The manner in which the side posts are fastened to the floor and to the top bows is most important. Cold rolled steel, of course, is tougher than other types of steel construction. A number of the manufacturing companies have now found means of assuring reasonably sturdy construction by using steel alloys that are as tough as steel, and by paying particular attention to the construction of the framework so as to give maximum strength to floor supports, posts, and bows, and yet have been able to produce a bus body that is reasonably light in weight. Some companies, unfortunately, have left sharp edges of bows or posts exposed in the interior of the bus. This should not be permitted. It can readily be avoided without adding to the weight of the bus.

Balance.—Proper balance is a very important factor in helping to prevent accidents. Some of the early bus bodies were mounted on truck chassis. Some of them also extended so far in the rear—that is, the overhang was so great—that the vehicle was not properly balanced. Others, in attempting to contribute to balance, left the inside height so low that children were needlessly cramped. Experience proves that the body should not be mounted on a chassis unless it is especially adapted for such usage. The body should be slung low enough to make the center of gravity reasonably low, yet the inside height should probably be not less than 66 or 67 inches. The outside width should not be greater than 96 inches. The amount of overhang at the rear should be so limited by regulation that there is no danger that the bus may become unbalanced when fully loaded and on the steepest grade over which it is supposed to travel.

Seating.—Seating has been a major problem which frequently has not received sufficient emphasis. In order to make possible the maximum seating space, earlier buses commonly were equipped with longitudinal center seats as well as side seats. Moreover, the aisles were frequently so narrow that the knees of children had to be jammed in between the knees of other children and no free aisle space was left. Whenever the bus stopped or started, there was a tendency for all children to slide toward the front or

Better buses, better regulations, better drivers, and better roads have contributed to the development of better schools in every state in the Union

Courtesy of Bender Body Company

A modern, all-metal school bus with many safety features. Safety glass, enclosed steps, dual rear wheels, an exhaust pipe which extends at least to the rear of the body, and front and rear bumpers securely fastened to the chassis, are now standard features

Courtesy of the Wayne Works

One of the larger modern buses with many good features. However, the rigid bars covering the entire window space on one side are subject to serious challenge

Courtesy of the Wayne Works

toward the rear. Moreover, since the rear door was frequently unsatisfactorily fastened, there was always danger that children, particularly those on the center seats, might slide out of the rear door; in fact, a number of accidents of that nature are on record. Most companies have now found ways and means of rectifying the most unsatisfactory phases of the earlier seating situation without sacrificing too much in the way of seating space. At least, the seats in the center are now usually arranged to face the front. Of course, from the point of view of safety and comfort, the ideal arrangement would be for all seats to face the front, and many of the newer bodies are so arranged that this is possible without a material reduction in seating capacity.

Doors.—The emergency door has almost always caused trouble. Some of the earlier bodies were built without the emergency door, but that offered too great a hazard. In some cases, the door was built at the rear of the left side of the bus, but that did not solve the problem, because sometimes children had to get out into the highway, and that offered serious hazard. The idea of a completely driver-controlled rear door was eliminated a number of years ago because of the danger that the control might jam and the children be unable to open the door in an emergency. If driver control is provided, it is now recognized that the latch must be so arranged that the door can be opened independently of that control. Some companies put a so-called safety latch on the rear door, which did not always prove satisfactory. This latch was enclosed in glass, and a hammer attached to a chain was provided so that the glass could be broken. Many of the newer models have reduced the possibility that the rear door may swing open and the children fall out while the bus is in motion, by setting the door so that it automatically tends to remain closed. Moreover, the newer latches have been improved so as to make them more reliable.

Practically all regulations now require children to get on or off buses only by means of a door located at the right front corner of the bus. This door should, by all means, be driver-controlled. The door should enclose the step and should be of the double type with glass panels. Safety flaps should be provided to avoid any danger of children's hands' being caught in the door.

Windows.—Some of the earlier buses had no windows. Many of them, particularly in the milder climates, were constructed with openings on either side, which in some cases were covered by a wire netting. Canvas flaps were provided that could be rolled down in bad weather. This was not satisfactory, because the wire netting offered a hazard in case of accident by preventing the children from escaping, and the canvas made the bus entirely too dark.

The early windows were, of course, of breakable glass and were a serious hazard. Practically all regulations now require shatterproof glass in windows, as well as in doors and windshield. Though that adds slightly to the cost, it is fully justifiable.

Some of the earlier regulations also required guards over the windows along the left side of the bus. These were to prevent children from sticking hands or arms out of the windows. Newer regulations provide that if guards are placed over the windows enough space is to be left at the top so that children can crawl out in case of emergency. This is a most important safety feature.

Color and Lettering.—There are still one or two states that have laws requiring red, white and blue as distinctive school-bus colors. This combination of colors is objectionable from several points of view. One of the most objectionable features is the added cost, which commonly amounts to as much as $35 per bus. Lack of attractiveness and limited visibility of lettering are other objections.

Most states are now standardizing on what might be called "school-bus orange." Several states have set up specifications for this particular color, requiring that the body be painted in "school-bus orange," that the lettering be in black, unshaded, vertical letters not less than 4 or 5 inches high with a 1-inch stroke. In many cases regulations permit the top to be painted an aluminum or a light color because of its reflecting qualities.

There is still urgent need for greater standardization in the coloring and lettering of school buses. Motorists traveling from one state to another frequently have difficulty in distinguishing school buses from commercial or other vehicles. The lettering may vary from "Caution—School Bus" to "Stop—School Bus," or merely the words "School Bus." Perhaps the most common lettering is "Stop—School Bus." This is not desirable. It does not mean what it says. Frequently a bus will be parked at the side of the road and children will not be entering or leaving. In such a situation, other vehicles approaching should not be told to stop.

Stop Signal.—Many conscientious motorists have encountered school buses in situations in which they were puzzled to know whether they should or should not stop. The rule should be, "When in doubt, stop." However, if that were rigorously followed, many motorists would find themselves stopping unnecessarily. Some standardized plan of indicating to the motorist when he should stop should be adopted and followed in all states.

After careful investigation, the Florida authorities have determined to change the wording to "School Bus—Stop on Signal," and to require each bus to be equipped with a stop signal operated by the driver.

Emergency rear door and device to prevent accidental release. This is one of the many developments for preventing accidental release of rear door. Unfortunately, very few of these devices have proved entirely satisfactory

Improved visibility as well as increased strength result from proper all-steel construction

Rounded front corners constitute a major improvement. Many other safety features are to be noted, including a stop sign, reflectors, clearance lights, and safety glass

Photos by courtesy of International Harvester Company

This signal is to be extended when the driver is bringing the bus to a stop in order to load or discharge children, and is to remain in position as long as children are being loaded or discharged or are crossing the road. Such a signal unmistakably warns all vehicles to stop at that particular time. This signal should, of course, be on the left side and so lettered that it is clearly visible at a considerable distance. A white background with the word "Stop" printed in red letters not less than 3 inches high with a ½- to ¾-inch stroke seems reasonably satisfactory. Motorists will thus know that they must stop when the signal is extended and that they need not stop at other times.

Other Equipment.—Minimum standards must be established for other features of school buses or their equipment in order to insure safety and efficiency in operation. Lighting is one feature that has been neglected, particularly in the older buses. Every bus should be equipped with interior lights which can be used on occasion. Moreover, clearance or marker lights should be provided and standardized to conform to Interstate Commerce Regulations. The two front clearance lights should be of amber color when lighted, and the two rear clearance lights of red color. Proper mirrors, windshield wipers, fire extinguishers, a first aid kit, and tools, should always be required.

Ownership as Related to Efficiency in Transportation

Neither county or district ownership nor private ownership, as such, has any necessary direct relationship to the provision of efficient transportation service. Experience indicates that contract transportation service may be just as efficient, if properly regulated, as county-owned transportation.

Many local school units, in the midst of a rapidly growing transportation problem, have continued to use the contract plan, largely because that was the first one followed. Often standards for equipment as well as for operation have been indefinite or lacking entirely, and under such conditions efficient transportation services could hardly be expected.

Other local school units have set definite standards, both for equipment and for operation, and have succeeded in developing a system of transportation under private ownership and contract that is reasonably satisfactory and efficient. Some of the problems involved in this particular plan of transportation present serious difficulties. If the contractor has purchased his own bus and is paying for it, the board may hesitate more to cancel the contract of a careless driver. Moreover, there is always the possibility that a route may be changed during the year, and complications may arise as a result unless this possibility has been anticipated.

County or district ownership should put the administrative unit in somewhat better position to set minimum standards for equipment as well as for operation. Local school units, however, have not always taken advantage of this opportunity. Unless the system is most carefully worked out, there may be just as many difficulties from county or district ownership as from private ownership. Local school units have assumed that county or district ownership and operation would, in itself, solve most of the problems. In reality, many serious problems are involved which are bound to bring on difficulties unless they are given proper attention.

Most of the evidence available does seem to indicate that county ownership offers possibilities for economy and, at least from that point of view, for somewhat greater efficiency than the contract plan. Whether or not these possibilities are realized will depend largely upon the plan of administration.

Relationship of Maintenance to Efficiency

One of the first requisites for promoting both the safety and economy phases of efficiency is that each local school administrative unit shall have an adequate, definite maintenance program. This must involve, first of all, prompt and immediate attention to whatever needs attention. Neglect of small things will sometimes involve not only needless cost, but also serious hazards to the pupils. Drivers should be sufficiently skilled and trained to recognize at once any variation from normal conditions. The maintenance program should provide for immediate inspection and correction of such conditions.

Moreover, the maintenance program should provide for a periodic systematic check of all school buses. This check should determine not only those conditions which need to be corrected from a safety point of view, but those conditions which, if neglected, will be likely to involve added expense at a later date.

Neglect of brakes may bring on a tragedy; neglect in greasing may likewise bring on a tragedy, but is more likely to result in some needlessly worn part which will involve unnecessary cost for replacement.

Relationship of Routing to Efficiency

The first step in planning efficient routing for school buses is to determine where the children live. Of course, school officials responsible for routing have always known in a general way the answer to this question. There is, however, a major difference between having in mind the answer to the question and having the information shown on a map. In every such instance, maps should be prepared showing the location of schools, the location and condition of roads which may be used for transportation, and the location of each elementary and secondary child who may be transported. Of course, the route cannot be planned to pass the door of every child to be transported.

Buses in general should not deviate from what might be designated as the trunk route to pick up children, unless such children live more than a stated distance from the main route. Many extreme inefficiencies are encountered in this field by those who study the problem. For example, one instance is known of a bus that deviates from the main route to pick up each child at his home, even though he may not live more than a quarter of a mile from the route. Over a period of a year the cost of such deviation will be considerable. Another instance is known of a bus that passes the home of a school trustee to bring children into the school on the first trip. But, since the hour is rather early, the trustee has the bus deviate six miles from its regular second trip in order to pick up his children, who can spend the extra time thus allowed in helping their parents.

A study of roads is also another essential to efficient routing. There are still extensive areas in many states in which at least some of the roads are not suitable for all-weather travel by school buses.

A school transportation route survey form was developed a few years ago by the writer, in cooperation with A. F. Harman, now President of Alabama College, Montevallo, Ala., and Dr. Paul R. Mort, Teachers College, Columbia University. This form is designed to provide objective information regarding road conditions, so that it can be used not only for studying possible routing but also for bringing needed information to other county officials responsible for road improvement. A copy of this form is shown in connection with this article. A study of the form will show that it is a relatively simple matter to set the speedometer at the school and then to record the readings and classify the roads and the hazards as the route is inspected. This, of course, is done from the point of view of its relationship to the school transportation problem rather than from an engineering point of view.

SCHOOL TRANSPORTATION ROUTE SURVEY FORM

(Trace route in the order in which pupils are transported from school in the afternoon where possible)

County ..... Checked by ..... Date ..... 193...

I. THE ROUTE.

A. 1. From ..... (Main School) To ..... (Terminus)

By Way of .....

2. Name Other Schools Served .....

B. If potential route, check here ..... C. If route is run in reverse order, check here .....

D. 1. Route No. ..... 2. Bus Owner ..... 3. Driver .....

E. Length of Route to Nearest One-Tenth Mile: 1. From main school to place where last pupil is discharged in the afternoon ..... 2. Additional distance traveled ..... 3. Total (1+2) .....

II. ROAD SURFACE BY LENGTH AND MAINTENANCE

	Maintained By*	From:	To:	Total:
A. Hard Surfaced				
B. Other Surface				
C.				
D. Graded				
E. Unimproved				

*If State Highway check in this column; if Federal Highway, write U. S.; if County write Co., etc.

III. CONDITION OF ROAD

A. Satisfactory (Broad, well-surfaced)

B. Narrow (Less than 16 feet)

C. Rough and Bumpy

D. Needs Surfacing (Very muddy, slippery in wet weather.)

V. RECOMMENDATIONS ON ROUTE

A. Well adapted in present condition .....

B. Fair. Passable at all times .....

C. Impassable after prolonged rains .....

D. Treacherous after any rain .....

E. Could be well adapted by changes indicated under IV. on right .....

F. Hazardous at all times .....

F. Totally unsuited ..... Reason .....

FOR FURTHER COMMENTS USE OTHER SIDE OF SHEET

IV. CONSECUTIVE SUMMARY OF HAZARDS

	Kind or Nature of Hazard**	Distance from Beginning	Recommendations and Comments***
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			

**The following key or guide may be used in describing the kind or nature of hazard:

A. Blind Curve
B-1. Narrow Bridge
B-2. Unguarded Bridge
B-3. Unsafe Approach
B-4. Needs Repairs
C. Bad Culvert
D. Deep Ditch or Wash
G. Needs Gravel
H. Dangerous Hill
M. Bog or Mud Hole
R. Dangerous Ravine
U-S. Unbridged Stream
U-T. U-Turn
R-T. Right Angle turn to right
L-T. Right Angle turn to left
X. Railroad Crossing
Y. Highway Crossing

***Key for Recommendations:

1. Urgent—Should be remedied at once.
2. Should be remedied as soon as practical.
3. Driver should be instructed to use extra care and caution.

This form is intended to provide data useful to officials responsible for road improvement, as well as to those charged with bus routing

It is important to have a list of the hazards on each route, for two reasons: (1) the compilation of a list and exact location of hazards that can be remedied will provide information that can be used to show changes that need to be made; and (2) if the hazards cannot be remedied, the list can be placed in the hands of the school-bus driver, thus, in effect, serving notice on him to be exceedingly careful at the places where the hazards exist. One accompanying photograph shows a school-bus route that involves a blind curve, a right-angle turn, and a blind railroad crossing over the main line of an important railroad. A school bus traverses this route daily. The first step should be to try to get such a dangerous hazard eliminated. Failing to do that, the authorities should be sure that the bus driver recognizes the seriousness of the hazard and exercises the necessary precautions.

Another important factor in efficient routing is the location of storage facilities for school buses. A careful study of possible storage locations should be made before routing is definitely arranged. The number of miles that must be traveled empty by any school bus necessarily increases the cost. In a district in which the percentage of miles traveled empty is less than one-tenth of the total, the unit cost of transportation should be considerably less than in a similar situation where the distance traveled empty represents as much as 30 or even 40 per cent of the total. Frequently, insufficient attention is paid to this matter. Of course, the arrangement of routes so that there is no travel empty is often impossible. The question may then become one of relative values. At any rate, all phases of the problem should be studied, and the most practicable arrangement possible should be made.

Another important factor is the distance of the pupils from school and the travel distance involved on the basis of various routing proposals. It is possible to so route buses that the total travel distance to school for some of the most remote children would be entirely too great. There are instances where children have had to leave their homes as early as six o'clock in the morning in order to catch the bus, and were not

returned to their homes until 5:30 in the evening. Such a situation might be due to the fact that the bus had to make more than one trip, or to the fact that the route was entirely too long, particularly in view of the road conditions. A route should be so arranged that no child has to leave home more than an hour before school begins, and that no child arrives at school more than a half-hour before school begins. There may be exceptional situations where this is impossible, but those should be very few.

Efficient school-bus routing might therefore be defined mathematically as the process of finding the fewest possible lines of not to exceed a maximum length that would best fit a given situation, taking into consideration all the factors involved. Of course, that is no easy task, particularly because it cannot be solved like a mathematical equation. It must be solved in terms of a number of factors that are subjective. Routing is a matter, however, that usually can be improved by proper attention, except perhaps in those situations where the school has been improperly located in the first place, and where routing can only be relatively efficient.

Qualifications of the Driver as Related to Efficiency

According to tradition, almost anyone who could get a contract or be employed as a school-bus driver was accepted as being capable of handling a school bus. School authorities have discovered that they do not necessarily improve the efficiency of their transportation service merely by providing better equipment. The driver is the most important factor in efficiency. If the contract system is employed, the driver may represent the difference between reasonable safety and extreme danger, between reliability and unreliability or between economy and lack of economy.

Most states that require a driver's license have apparently assumed that the driver of a school bus is properly qualified if he holds the same license as drivers of other buses or other vehicles. In Alabama, for example, the driver of a school bus is required only to hold a regular driver's license, which is issued to anyone who pays the required fee. In Florida, the driver of a school bus has been supposed to hold a chauffeur's license, required of all drivers of commercial buses and issued to anyone who pays the higher fee required of such drivers. Ohio has provided a special plan of licensing for school-bus drivers which has met with some success.

School-bus drivers should have certain special qualifications not required of all other drivers. In the first place, a school-bus driver should, once each year, pass a rigid medical examination to show that he is free from contagious or communicable diseases and that he has no physical or nervous handicaps which might interfere with the proper operation of the bus. He should probably not be less than 18 or more than 60 years of age. The driver of a school bus should not only know traffic and driving regulations and understand them thoroughly, but should understand first aid and be able to use it in emergency, and should know enough of elemental psychology to be able to deal satisfactorily with children, parents, and even with teachers and principals. His problem is a most difficult one. Moreover, the driver must have a practical knowledge of his work. He must be an expert in handling a school bus but not so expert that he is over-confident. Above all, he must have a sense of responsibility on all occasions.

After studying the problem very carefully, the school authorities in Florida have taken steps to get away from a chauffeur's license as the only requirement. They have set up a requirement for a rigid physical examination, have defined age limits, and have required that each driver hold a certificate of physical fitness, as well as a permit to drive a school bus. Training classes are being organized to give instruction in bus operation and maintenance, in first aid, in traffic regulations, and in problems of discipline. However, they have recognized the fact that complete development of this plan will take several years and that only the first basic steps can be taken in any one year.

One of the fundamental difficulties comes from the fact that many local school units have not clearly defined the duties and responsibilities of the school-bus driver. While each driver has some conception of his own responsibilities, and the school authorities know something of what they expect from him, the careful analysis needed has not generally been worked out. Further study of this problem should aid in defining qualities which should be a prerequisite for granting permits which should probably be in the hands of state school authorities, rather than in the hands of some other agency.

Relationship of Operating Regulations to Efficiency

As a general principle, definite operating regulations are necessary for the efficient operation of any school-bus route. One phase of those regulations must define the relationship of the driver to various types of hazards and set forth his conduct as nearly as possible when he encounters such hazards. For example, they must require him to bring the bus to a full stop before entering any through highway, and not to proceed until he has assured himself that it will be safe to do so.

Another phase of operating regulations will involve the relationship of the driver to the pupils transported. The matter of when pupils should cross the highway after being discharged from a bus has not been given

This blind curve and railway crossing is a striking example of an exceedingly dangerous hazard that should be eliminated

One method of getting over a muddy place on a transportation route

Roads like this should be ruled out of the transportation route. This road was actually used for a time for school transportation—in good weather

A blind curve and an unsafe approach to an old-fashioned covered bridge on a transportation route

enough attention. Studies show that there have been far too many fatalities due to the fact that pupils have started, without proper supervision, to cross the highway just after getting off the bus.

Florida school officials, after studying this matter carefully, decided to require that no pupil be permitted to cross the highway after being discharged from a bus except under supervision of the driver. Pupils are required to cross *in front* of the bus, rather than behind the bus. The reason for this is obvious. If a pupil crosses behind the bus, the driver cannot see the pupil, and the pupil cannot see oncoming cars —that is, cars coming to meet the bus—until he has stepped out from behind the bus. Many accidents occur in that manner.

On the other hand, the driver is in position to see any pupil who crosses in front of the bus, as well as to see all oncoming cars. If the regulations require that a pupil shall not step from in front of the bus until signaled to do so by the driver, he is given a margin of safety that could not otherwise be provided. Florida regulations also require the stop signal to be extended, which serves notice on all vehicles coming from both directions that they must stop. Those coming from the rear under such circumstances are probably more likely to stop than those coming from the front, which again gives the child an added margin of safety because he, as well as the driver, can see those cars coming from the front. Moreover, since this is standardized on a state-wide basis, all motorists will know what is expected of them when the stop signal is extended. If they do not observe the law and regulations, they can have no excuses or reasons for requesting an exception from the courts.

Other operating regulations that are most important have to do with the speed of the bus, stopping the bus on a curve or a hill, leaving the bus without setting the brake, operating the bus when the clutch is disengaged, backing the bus on the school grounds, using worn tires, filling the gasoline tank, etc. A study of these matters will show the urgent need for establishing standards and regulations.

The Relationship of Records and Reports to Efficiency

No business can long exist and prosper without an adequate system of records and reports. No transportation program can be carried on efficiently over a period of time unless the system of records and reports calls for making available the facts needed to evaluate policies and propose improvements in policies to be formulated. As a means of providing the information that should be available in all counties, regardless of the type of ownership, each bus driver should be required to submit a monthly report before his salary or contract for the month is paid. This report should, at least, give the number of pupils assigned to his bus by schools, and should certify that he has observed all transportation regulations during the month.

In local school units that own and operate the buses, additional information will have to be provided on gas and oil consumption, mileage, and labor and parts for maintenance. If these data are made available, the superintendent can develop a plan for studying routes, relating cost to the various factors involved, and making adjustments either during the year or before the next year, to remedy inefficiencies. Further economies will frequently be possible without detracting from the services rendered.

Responsibilities of the Local School Administrative Unit

The responsibility of the local school administrative unit for developing a plan that will result in the maximum efficiency with reference to each of the points discussed above should be recognized, regardless of whether the state does or does not set up minimum standards.

If this principle is observed, each local school administrative unit will find it necessary to establish minimum standards and regulations and to see that they are observed. If the state has already set minimum standards in certain fields, the local school administrative unit will have to determine whether or not its own standards should be higher than the standards set by the state. It has the responsibility of seeing that state as well as local standards are observed, because the safety of local children is involved.

The local school administrative unit also has the responsibility for making a continuous study of the transportation situation and needs in order to determine possibilities for improvement. Unless there is a plan for such studies, many opportunities for increasing efficiency will be overlooked. The local school administrative unit should, moreover, cooperate closely and voluntarily at all times with the state officials in carrying on any studies that may be needed or in working out improvements in the program. Frequently such improvements can be made through close cooperation, where otherwise they might be impossible. State officials and local school officials need mutual cooperation and support if desirable improvements are to be made.

Responsibilities of the State

State officials have three definite major responsibilities in improving the efficiency of the transportation service: first, to provide leadership and stimulation; second, to establish reasonable minimum stand-

ards; third, to develop a plan of state-aid that will contribute to the attainment of objectives.

Leadership.—Many improvements in transportation can be brought about through state leadership. In fact, unless minimum standards and regulations are supported by competent leadership, many of them are likely to go unobserved. While there are always progressive local school administrative units which will continue to improve their own programs without state leadership, other units will be found in almost every state in which no progress will be made without dynamic leadership. Suggestions from the state, conferences in which various problems are discussed, state studies of various phases of the problem, the results of which are made available, and other evidences of strong leadership, should aid materially in bringing about improvements even in the least progressive sections of the state.

Minimum Standards.—While state standards cannot take care of every possible contingency, they can help to provide needed safeguards. If a single accident occurs because the state has failed to be aware of the problem and to set up minimum standards that might have helped to prevent an accident of that type, the state cannot escape some responsibility for having neglected this opportunity.

During recent years, most states have attempted to set up more comprehensive minimum standards than ever before, because the need has been so obvious. A number of states now have minimum standards covering nearly every phase of transportation service. The N. E. A. bulletin on "Safety in Pupil Transportation," published in November, 1936, shows the extent to which many of the states had gone already in setting up standards at that time. Relatively much more progress has been made since the publication of that bulletin. A number of states have either completely revised their standards or are so doing.

Florida is an example of these states. The Florida standards, revised and adopted by the State Board of Education during the spring of 1938, are probably more comprehensive than those that have been adopted in any other state. They comprise approximately 25 printed pages and cover nearly every phase of the field. These standards were not adopted by the state merely on the initiative of state officials, but were worked out by a committee of county superintendents in close cooperation with members of the staff of the State Department of Public Instruction and were then adopted by the State Board of Education as the result of the joint recommendation of county superintendents and State Department officials.*

* *"Standards and Regulations Relating to the Transportation of Pupils to the Public Schools of Florida."* Florida State Department of Public Instruction, Tallahassee, Fla., 1938.

State-Aid.—In many plans of state-aid or of equalization, aid for transportation has practically been ignored. Some of those states that have provided state-aid for transportation seem to have assumed that the need for transportation would be directly proportionate to the need for instruction units. That is not at all the case. In fact, it is in the most sparsely populated counties that the need for transportation is proportionately greater.

Some states have set up specific ear-marked funds which may be used for transportation alone. However, most of those states seem to have had difficulty in finding the proper basis for apportioning the transportation funds.

In other words, most of the plans of state-aid or equalization involving transportation which have been worked out to date have proved unsatisfactory in one or more respects, and many of them have already been revised or abandoned. The observations below are suggested as the basis for recommending certain principles which should help in solving this problem.

Experience seems to indicate that any plan which obligates a state to pay all the costs of transportation is wrong. If a state does pay all the cost, the feeling that transportation may be expanded indefinitely without much regard to actual economy may arise in some communities. About the only way that economy may be assured is for the state to take the next step and plan the routing as North Carolina has done, at least to some extent. That procedure is fundamentally wrong. The initiative should be left with the local school administrative units, the state establishing necessary minimum standards and providing incentives for economical administration, but leaving the community to pay out of its own funds for any lack of economy. While North Carolina has been able to secure reasonably economical administration, it has done so, in many cases, at the expense of efficiency; that is, by overcrowding buses, by providing too many trips, or by taking certain other steps which violate some of the fundamental principles and thus interfere with efficient operation.

Any state plan that allows aid at the rate of so much per bus, based on the size of the bus, is also likely to involve difficulty, as both New Jersey and Ohio have found. Communities may desire to put on more of the smaller type of buses because more state-aid will be provided for those buses. This might be compared to the form of state-aid that provides a certain amount for each of the one-teacher schools in the state, as in Illinois. Communities that have three very small one-teacher schools could not be expected to combine those schools if the combined school would draw only one-third as much state-aid as would be drawn by the three schools when operated separately.

It may therefore be observed that any plan of state-aid that does not encourage economy and efficiency in the local administration of transportation is wrong. Moreover, the plan is wrong if it does not take into consideration the factors which are most directly related to the need for transportation service.

The Alabama plan adopted in 1935 has outstanding merit in a number of respects. It seems to have operated most satisfactorily in that state, except for the fact that funds available have been so limited that it has not been possible to raise standards for equipment as much as they should have been raised.

The Alabama plan provides state-aid for transportation as a part of the minimum program. The minimum needs for teachers' salaries, for transportation, for other current expenses, and for capital outlay are determined objectively and in accordance with stated formulas. After these needs have been found and translated into costs on an objective basis, the next step is to determine the funds that are available from local sources, based on a uniform tax levy, and from the state school census fund, which is not apportioned on an equalization basis. The difference between these funds and the cost of the program therefore represents the need for minimum program funds. The state provides funds in accordance with that need. Thus, both the county and the state contribute to the cost of all phases of the program.

The transportation need is determined separately from the need for other phases of the program but is added to other needs in determining the total. Transportation needs are determined, first, by finding the density of transported population in each of the counties. Counties with similar density of transported population are then grouped and unit costs are found. In other words, density of transported population is found to be the one factor that is of most significance in influencing costs. Most other factors are directly correlated. For example, counties with the lowest density of transported population are likely to be those with the poorest roads and the fewest pupils per bus route.

However, that step alone does not go far enough, because some counties have already made more progress with transportation than others. It is necessary, as another step, to compute a "transportation saturation index" as a means of determining relatively how far each county has progressed with its transportation program. The cost based on density of transported population must then be adjusted on the basis of the "transportation saturation index." Those counties which have already reached transportation saturation cannot have an additional allowance for transportation figured in the minimum program. Those which have not reached saturation have some leeway for expanding their transportation, the cost being borne by both state and local funds.

Another outstanding advantage offered by the Alabama plan is the incentive for economic and efficient operation of buses. The need is computed objectively on the basis outlined above. That need has been found, in practice, to vary from about 7 cents per pupil per day in some of the most densely populated counties to approximately 17 cents per pupil per day in some of the most sparsely populated counties. Need in terms of cost is then computed on this basis and included in the program. If any county can operate its transportation program more economically than the average for its group, any money thus saved can be used by that county for improving other phases of its program or for expanding its transportation service.

Summary

The problem of providing efficient transportation service thus has many angles. Economical operation of buses is only one of those phases. If this is achieved and other phases are neglected, the transportation program cannot be said to be on an efficient basis. Safety is one of the prime essentials and must be considered even before economy of operation. Other essentials involve reliability and comfort. If efficient service is to be provided, proper attention must be given to establishing minimum standards for equipment, to determining the best plan for ownership and operation, to establishing minimum qualifications for drivers, and to the proper selection of drivers, to routing, to operation and maintenance, and to the record and reporting system. The local school administrative unit necessarily has certain basic responsibilities which must be carried out either alone or in cooperation with the state. The state has the responsibility for providing leadership, for establishing minimum standards, and for setting up a plan of state-aid, which will tend to promote economy and efficiency in the operation of the transportation service.

THE BENDER BODY COMPANY

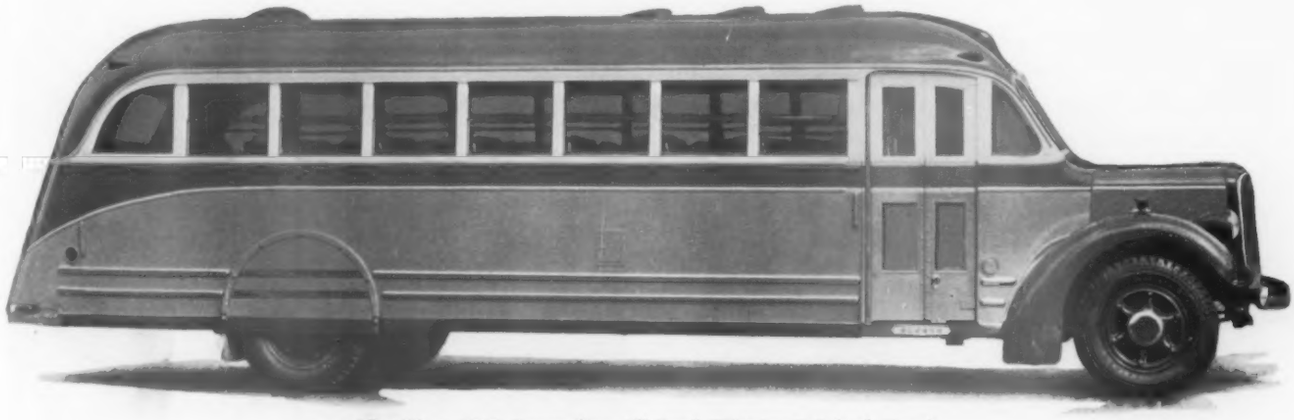
Manufacturers of
School Coach Bodies

Cleveland and Elyria, Ohio

The Bender plant at Elyria—19 acres under roof

The oldest and largest independent manufacturer of bus bodies in America with facilities second to none offers to school executives an up-to-date, safe and economical school coach to meet any budget requirement of your board.

FIVE DISTINCT LINES of busses meeting all legal requirements of any state in the Union



The New 1939 Streamline All-Steel "Monitor" School Coach

Over 10,000 Bender Passenger busses operating in U. S. Bender's splendid reputation for building the "best" warrants your consideration — Write, wire or phone for prices or for location of closest Bender distributor.

Distributors in all principal buying Centers

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)

180 No. Michigan Ave. Chicago, Illinois

Insist on INTERNATIONAL SCHOOL BUSES

They're SAFE
They're ECONOMICAL
They're DEPENDABLE

The importance of safety, economy, and dependability in school transportation cannot be emphasized too strongly. In building school bus chassis, International Harvester is guided by these fundamentals. Every International school bus chassis combines sound design, sturdy construction, and modern mechanical refinements to provide safe transportation at low cost.

School bus requirements vary with road conditions, lengths of routes, and the number of children to be transported. International chassis are available in standard wheelbase lengths to mount school bus bodies made by any manufacturer. With this coordination of body and chassis, the weight of the buses and the passenger loads are properly distributed between front and rear tires.

Before you invest in school transportation or award hauling contracts, make a thorough investigation and you will see why so many school boards insist on International buses. More than thirty years of experience in the manufacture of quality automotive units is back of Internationals. Service is provided by 242 Company-owned branches and service stations and thousands of International dealers.

Write for the International school bus catalog and for the "School Bus Cost Record"—a simple method of keeping costs on school bus operation and maintenance.

Sturdy chassis and all-steel bodies protect the children

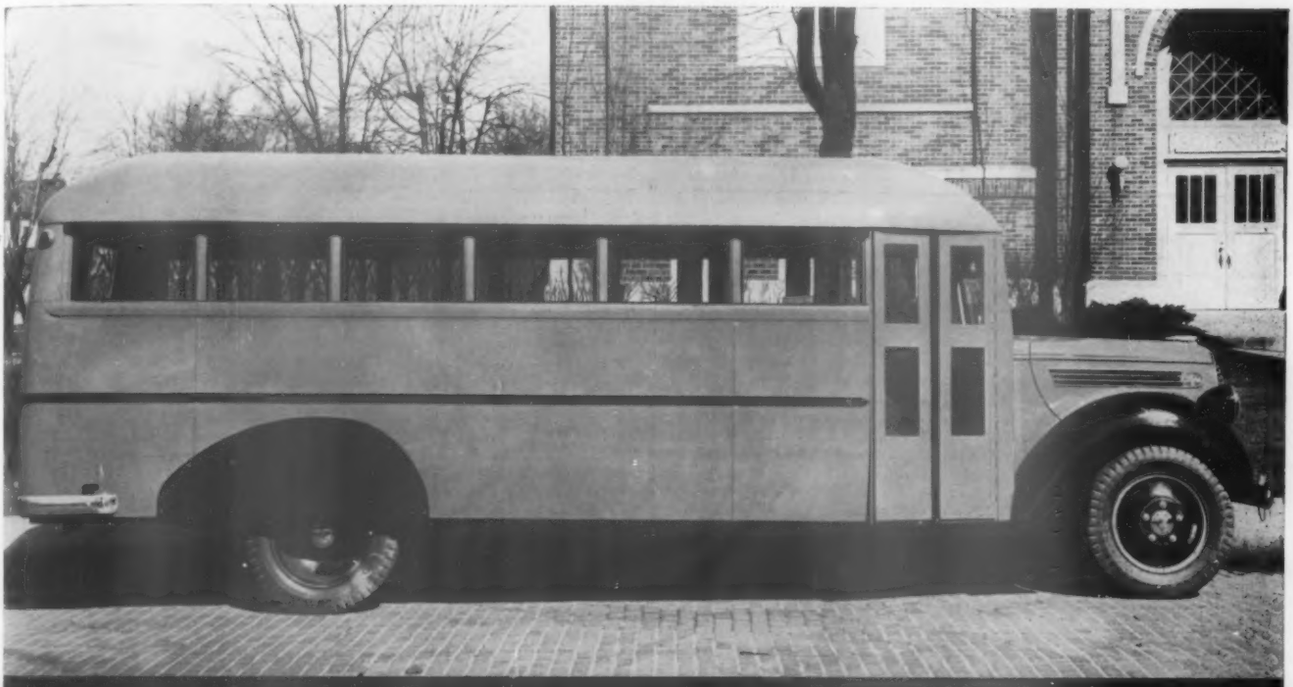
Long wheelbase Internationals for outlying routes

Internationals are safe and economical to operate

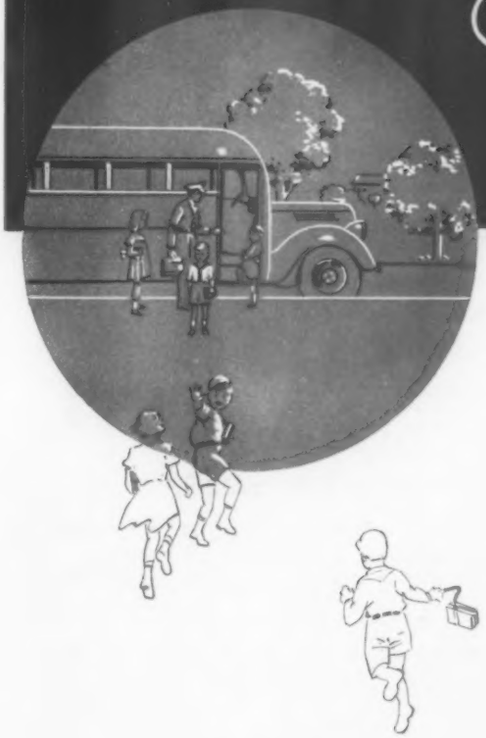
Internationals solve school-hauling problems

AMERICAN WINDOW GLASS COMPANY

Pittsburgh, Pa.



Protect the children with windows of PLEXITE



"School buses must be the last word in safe transportation," that is why it is important to use Plexite, the safer safety glass, in all bus windows because Plexite is not a rigid safety glass—it gives like a safety net on impact—cushions the blow and provides greatly increased resistance to penetration. Plexite is truly an improved product. It cannot blotch nor discolor, offers perfect visibility at all times and provides high sound-insulating efficiency. It can be cut almost as easily as ordinary plate or window glass. Most of the more modern buses built in this country are already equipped with Plexite. When ordering your next bus be sure to specify the truly safer safety glass. Genuine Plexite is manufactured by AMERICAN WINDOW GLASS COMPANY, PITTSBURGH, PA.

PLEXITE

THE SAFER SAFETY GLASS

SECTION XIII
COLLEGE, UNIVERSITY AND NORMAL SCHOOL PRESIDENTS

City	Institution	President
Alabama		
Athens	Athens College	E. R. Naylor
Auburn	Alabama Polytechnic Institute	L. N. Duncan
Birmingham	Birmingham-Southern College	Raymond Ross Paty
Birmingham	Howard College	T. V. Neal
Daphne	State Normal School	D. R. Murphey
Florence	State Teachers College	J. A. Keller
Jacksonville	State Teachers College	C. W. Daugette
Livingston	State Teachers College	N. F. Greenhill
Marion	Judson College	L. G. Cleverdon
Montevallo	Alabama College	A. F. Harman
Montgomery	Huntingdon College	Hubert Searcy
Montgomery	State Teachers College	H. C. Trenholm
Selma	Selma University	Wm. H. Dinkins
Spring Hill	Spring Hill College	Wm. D. O'Leary
Talladega	Talladega College	Buell G. Gallagher
Troy	State Teachers College	Chas. B. Smith
Tuscaloosa	University of Alabama	Richard C. Foster
Tuskegee Institute	Tuskegee Institute	F. D. Patterson
Arizona		
Flagstaff	Arizona State Teachers College	Thomas J. Tormey
Tempe	Arizona State Teachers College	Grady Gammage
Tucson	University of Arizona	Alfred Atkinson
Arkansas		
Arkadelphia	Henderson State Teachers College	Joseph A. Day
Arkadelphia	Ouachita College	James R. Grant
Batesville	Arkansas College	John Crockett
Clarksville	The College of the Ozarks	Wiley Lin Hurie
Conway	Arkansas State Teachers College	H. L. McAlister
Conway	Hendrix College	J. H. Reynolds
Fayetteville	University of Arkansas	John C. Futrall
Jonesboro	Arkansas State College	V. C. Kays
Little Rock	Arkansas Baptist College	Tandy W. Coggs
Little Rock	Philander Smith College	M. LaF. Harris
Little Rock	St. John's Seminary	James P. Gaffney
Monticello	Arkansas Agricultural and Mechanical College	Marvin Bankston
North Little Rock	Shorter College	G. A. Gregg
Pine Bluff	Agricultural, Mechanical and Normal College	John B. Watson
Searcy	Harding College	George S. Benson
Siloam Springs	John Brown University	John E. Brown
California		
Angwin	Pacific Union College	Walter I. Smith
Arcata	Humboldt State College	Arthur S. Gist
Berkeley	Pacific School of Religion	James Muilenburg, Acting Dean
Berkeley	University of California	Robert G. Sproul
Chico	Chico State College	A. J. Hamilton
Claremont	Claremont Colleges	Russell M. Story
Claremont	Pomona College	C. K. Edmunds
Claremont	Scripps College	Ernest J. Jaqua
Fresno	Fresno State College	F. W. Thomas
La Verne	La Verne College	C. Ernest Davis
Los Angeles	Chapman College	C. F. Cheverton
Los Angeles	College of Medical Evangelists	Percy T. Magan
Los Angeles	College of Osteopathic Physicians and Surgeons	P. T. Collinge, Acting Dean
Los Angeles	George Pepperdine College	Batsell Baxter
Los Angeles	Immaculate Heart College	Sister Mary Redempta
Los Angeles	Loyola University of Los Angeles	Charles A. McQuillan
Los Angeles	Occidental College	Remsen D. Bird
Los Angeles	University of California at Los Angeles	Robert G. Sproul
Los Angeles	University of Southern California	R. B. von KleinSmid
Oakland	College of the Holy Names	Sister Mary Aloyse
Oakland	Mills College	A. H. Reinhardt
Pasadena	California Institute of Technology	Robert A. Millikan, Ch. Exec. Council
Pasadena	Pasadena College	H. Orton Wiley
Redlands	University of Redlands	Elam J. Anderson
St. Mary's	St. Mary's College	Brother Albert
San Diego	San Diego State College	Walter R. Hepner
San Francisco	Golden Gate College	Nagel T. Miner
San Francisco	San Francisco College for Women	Mother Leonor Mejia
San Francisco	San Francisco State College	Alex. C. Roberts
San Francisco	University of San Francisco	William J. Dunne
San Jose	San Jose State College	T. W. MacQuarrie
San Luis Obispo	California Polytechnic School	Julian A. McPhee
San Rafael	Dominican College of San Rafael	Sister Mary Thomas
Santa Barbara	Santa Barbara State College	Clarence L. Phelps
Santa Clara	University of Santa Clara	Louis C. Rudolph
Stanford Univ.	Stanford University	Ray Lyman Wilbur
Stockton	College of the Pacific	Tully C. Knoles
Whittier	Whittier College	W. O. Mendenhall
Colorado		
Alamosa	Adams State Teachers College	Ira Richardson
Boulder	University of Colorado	George Norlin
Colorado Springs	The Colorado College	Thurston J. Davies
Denver	Regis College	R. M. Kelley
Denver	University of Denver	David Shaw Duncan
Fort Collins	Colorado State College of Agriculture and Mechanic Arts	Charles A. Lory
Golden	Colorado School of Mines	M. F. Coolbaugh
Greeley	Colorado State College of Education	G. W. Frasier
Gunnison	Western State College	C. C. Casey
Loretto	Loretto Heights College	Paul J. Ketrick
Connecticut		
Danbury	State Normal College	Ralph C. Jenkins
Hartford	Hartford Theological Seminary	Rockwell H. Potter, Dean
Hartford	Trinity College	Remsen B. Ogilby
Middletown	Wesleyan University	J. L. McConaughy
New Britain	Teachers College of Connecticut	Herbert D. Welte
New Haven	Albertus Magnus College	Sister M. Isabel
New Haven	Arnold College for Hygiene and Physical Education	H. B. Arnold, Acting
New Haven	Berkeley Divinity School	Wm. P. Ladd, Dean
New Haven	Connecticut College of Pharmacy	Curtis P. Gladding
New Haven	New Haven State Teachers College	F. E. Engleman
New Haven	Yale University	Charles Seymour
New London	Connecticut College	Katharine Blunt
New London	United States Coast Guard Academy	E. D. Jones, Supt.
Storrs	Connecticut State College	Albert N. Jorgensen
West Hartford	St. Joseph College	Mother M. Benedict
Willimantic	Willimantic State Teachers College	George H. Shafer
Delaware		
Dover	State College for Colored Students	R. S. Grossley
Newark	University of Delaware	Walter Hullihen
District of Columbia		
Washington	The American University	Joseph M. M. Gray, Chancellor
Washington	Catholic University of America	Joseph M. Corrigan
Washington	Gallaudet College	Percival Hall
Washington	Georgetown University	Arthur A. O'Leary
Washington	George Washington University	Cloyd Heck Marvin
Washington	Howard University	M. W. Johnson
Washington	National University	Leslie C. Garnett Chancellor
Washington	Trinity College	Sister Berchmans Julia
Washington	Washington Missionary College	B. G. Wilkinson
Washington	Wilson Teachers College	Edgar C. Higbie

City	Institution	President
Florida		
Coral Gables	University of Miami	B. F. Ashe
Daytona Beach	Bethune-Cookman College	Mary McLeod Bethune
Deland	John B. Stetson University	Wm. Sims Allen
Gainesville	University of Florida	John J. Tigert
Lakeland	Florida Southern College	Ludd M. Spivey
Tallahassee	Florida Agricultural & Mechanical College for Negroes	J. R. E. Lee
Tallahassee	Florida State College for Women	Edward Conradi
Tampa	University of Tampa	John H. Sherman
Winter Park	Rollins College	Hamilton Holt
Georgia		
Albany	Georgia Normal and Agricultural College	J. W. Holley
Athens	University of Georgia	Harmon White Caldwell
Atlanta	Atlanta-Southern Dental College	S. W. Foster
Atlanta	Atlanta University	Rufus E. Clement
Atlanta	Clark University	M. S. Davage
Atlanta	Emory University	Harvey W. Cox
Atlanta	Georgia School of Technology	Marion L. Brittain
Atlanta	Morehouse College	Chas. D. Hubert, Acting
Atlanta	Morris Brown College	W. A. Fountain, Jr.
Atlanta	Spelman College	Florence M. Read
Augusta	Paine College	E. C. Peters
Collegeboro	South Georgia Teachers College	M. S. Pittman
Decatur	Agnes Scott College	James R. McCain
Demorest	Piedmont College	George C. Bellingrath
Forsyth	Bessie Tift College	C. L. McGinty
Gainesville	Brenau College	H. J. Pearce
Industrial College	Georgia State College	B. F. Hubert
La Grange	La Grange College	H. T. Quillian
Macon	Mercer University	Spright Dowell
Macon	Wesleyan College	Dice R. Anderson
Milledgeville	Georgia State College for Women	Guy H. Wells
Mount Berry	Berry College	Martha Berry
Oglethorpe University	Oglethorpe University	Thornwell Jacobs
Rome	Shorter College	Paul M. Cousins
Valdosta	Georgia State Woman's College	Frank R. Reade
Idaho		
Albion	Albion State Normal School	R. H. Snyder
Caldwell	The College of Idaho	Orma J. Smith, Acting
Lewiston	Lewiston State Normal School	J. E. Turner
Moscow	University of Idaho	Harrison C. Dale
Nampa	Northwest Nazarene College	Russell V. DeLong
Illinois		
Alton	Shurtleff College	William Henry Coleman, Acting
Aurora	Aurora College	Theodore Pierson Stephens
Bloomington	Illinois Wesleyan University	Wylie G. Brooks
Bourbonnais	St. Viator College	E. V. Cardinal
Carbondale	Southern Illinois State Normal University	Roscoe Pulliam
Carthage	Carthage College	Rudolph G. Schulz, Jr.
Charleston	Eastern Illinois State Teachers College	Robert G. Buzzard
Chicago	Armour Institute of Technology	Henry T. Heald
Chicago	Central Y. M. C. A. College	Edward J. Sparling
Chicago	Chicago College of Osteopathy	R. N. MacBain
Chicago	Chicago Teachers College	John A. Bartky
Chicago	Chicago Theological Seminary	Albert W. Palmer
Chicago	De Paul University	Michael J. O'Connell
Chicago	George Williams College	Harold C. Coffman
Chicago	Lewis Institute	F. A. Rogers, Acting
Chicago	Loyola University	Samuel K. Wilson
Chicago	Mundelein College	Sister M. Consuela
Chicago	Pestalozzi Froebel Teachers College	Herman H. Hegner
Chicago	St. Francis Xavier College for Women	Sister Mary Genevieve
Chicago	The University of Chicago	Robert M. Hutchins
Decatur	James Millikin University	John C. Hessler
De Kalb	Northern Illinois State Teachers College	Karl L. Adams
Elsah	The Principia	Frederic E. Morgan
Elmhurst	Elmhurst College	Timothy Lehmann
Eureka	Eureka College	Raymond F. McLain
Evanston	National College of Education	Edna Dean Baker
Evanston	Northwestern University	Walter Dill Scott
Galesburg	Knox College	Carter Davidson
Greenville	Greenville College	H. J. Long
Jacksonville	Illinois College	Harris Gary Hudson
Jacksonville	MacMurray College for Women	C. P. McClelland
Joliet	College of St. Francis	Sister M. Aniceta
Lake Forest	Barat College of the Sacred Heart	Mother Reilly
Lake Forest	Lake Forest College	H. McComb Moore
Lebanon	McKendree College	C. R. Yost
Lisle	St. Procopius College	Procopius Neuzil
Macomb	Western Illinois State Teachers College	W. P. Morgan
Monmouth	Monmouth College	James H. Grier
Mundelein	St. Mary of the Lake Seminary	Reynold Hillenbrand
Naperville	North Central College	Edward E. Rall
Normal	Illinois State Normal University	R. W. Fairchild
Peoria	Bradley Polytechnic Institute	F. R. Hamilton
Peru	St. Bede College	Justus Wirth
River Forest	Rosary College	Sister Mary Evelyn
Rockford	Rockford College	Mary A. Cheek
Rock Island	Augustana College and Theological Seminary	Conrad Bergendoff
Urbana	University of Illinois	A. C. Willard
Wheaton	Wheaton College	J. O. Buswell, Jr.
Indiana		
Bloomington	Indiana University	Herman B. Wells
Crawfordsville	Wabash College	Louis B. Hopkins
Danville	Central Normal College	Carl H. Griffey
Evansville	Evansville College	F. Marion Smith
Franklin	Franklin College of Indiana	Wm. Gear Spencer
Goshen	Goshen College	Sanford C. Yoder
Greencastle	DePauw University	Clyde E. Wildman
Hanover	Hanover College	A. G. Parker, Jr.
Huntington	Huntington College	Harold C. Mason
Indianapolis	Butler University	James W. Putnam
Indianapolis	Indiana Central College	I. J. Good
Indianapolis	Indianapolis College of Pharmacy	Edward H. Niles
Indianapolis	Normal College of the American Gymnastic Union	Carl B. Sputh
Lafayette	Purdue University	Edward C. Elliott
Marion	Marion College	Wm. F. McConn
Muncie	Ball State Teachers College	L. A. Pittenger
N. Manchester	Manchester College	Otho Winger
Notre Dame	St. Mary's College	Sister M. Madeleva
Notre Dame	University of Notre Dame	John F. O'Hara
Oakland City	Oakland City College	W. P. Dearing
Richmond	Earlham College	William C. Dennis
St. Mary-of-the-Woods	St. Mary-of-the-Woods College	Mother Mary Bernard
Terre Haute	Indiana State Teachers College	Ralph N. Tirey
Terre Haute	Rose Polytechnic Institute	Donald B. Prentice
Upland	Taylor University	Robert Lee Stuart
Valparaiso	Valparaiso University	O. C. Kreinheder
Iowa		
Ames	Iowa State College of Agriculture and Mechanic Arts	Charles E. Friley
Cedar Falls	Iowa State Teachers College	O. R. Latham
Cedar Rapids	Coe College	Harry M. Gage
Davenport	St. Ambrose College	C. H. Meinberg
Decorah	Luther College	O. J. H. Preus
Des Moines	Des Moines College of Pharmacy	F. W. Fitch
Des Moines	Des Moines Still College of Osteopathy	A. D. Becker
Des Moines	Drake University	D. W. Morehouse
Dubuque	Clarke College	Sister Mary Antonia Durkin
Dubuque	Columbia College	Thomas Conry
Dubuque	University of Dubuque	Dale D. Welch
Fairfield	Parsons College	Donald L. Hibbard
Fayette	Upper Iowa University	Vivian T. Smith
Grinnell	Grinnell College	John S. Nollen
Indianola	Simpson College	
Iowa City	State University of Iowa	Eugene A. Gilmore
Le Mars	Western Union College	D. O. Kime
Mount Pleasant	Iowa Wesleyan College	Stanley B. Niles
Mount Vernon	Cornell College	H. J. Burgstahler
Oskaloosa	William Penn College	Henry Edwin McGrew
Pella	Central College	Irwin J. Lubbers
Sioux City	Morningside College	Earl A. Roadman
Sioux City	Trinity College	Joseph V. Trunk
Storm Lake	Buena Vista College	Henry Olson
University Park	John Fletcher College	Charles W. Butler
Waverly	Wartburg College	E. J. Braulick

City	Institution	President
Kansas		
Atchison	Mt. St. Scholastica College	Mother M. Lucy Dooley
Atchison	St. Benedict's College	Martin Veth
Baldwin	Baker University	Nelson P. Horn
Emporia	College of Emporia	Dudley Doolittle, Acting
Emporia	Kansas State Teachers College	Thomas W. Butcher
Hays	Fort Hays Kansas State College	C. E. Rarick
Lawrence	University of Kansas	E. H. Lindley
Leavenworth	St. Mary College	Arthur M. Murphy
Lindsborg	Bethany College	Ernst F. Pihlblad
McPherson	McPherson College	V. F. Schwalm
Manhattan	Kansas State College of Agriculture and Applied Science	Francis D. Farrell
North Newton	Bethel College	Ed. G. Kaufman
Ottawa	Ottawa University	Andrew B. Martin
Pittsburg	Kansas State Teachers College	W. A. Brandenburg
St. Marys	St. Mary's College	M. Germing
Salina	Kansas Wesleyan University	E. K. Morrow
Salina	Marymount College	Mother Mary Rose Waller
Sterling	Sterling College	H. A. Kelsey
Topeka	Washburn College	Philip C. King
Wichita	Friends University	David M. Edwards
Wichita	Municipal University of Wichita	William M. Jardine
Winfield	Southwestern College	Frank E. Mossman
Kentucky		
Barbourville	Union College	John Owen Gross
Berea	Berea College	Wm. J. Hutchins
Bowling Green	Western Kentucky State Teachers College	Paul L. Garrett
Covington	Villa Madonna College	Michael Leick
Danville	Centre College of Kentucky	Robt. L. McLeod, Jr.
Frankfort	Kentucky State Industrial College	R. B. Atwood
Georgetown	Georgetown College	Henry Noble Sherwood
Lexington	Transylvania College	Richard H. Crossfield
Lexington	University of Kentucky	Frank L. McVey
Louisville	Louisville College of Pharmacy	A. P. Markendorf
Louisville	Louisville Municipal College for Negroes, University of Louisville	Raymond A. Kent
Louisville	Nazareth College	Sister Mary Anastasia Coady
Louisville	Southern Baptist Theological Seminary	John R. Sampey
Louisville	University of Louisville	Raymond A. Kent
Morehead	Morehead State Teachers College	H. A. Babb
Murray	Murray State Teachers College	James H. Richmond
Richmond	Eastern Kentucky State Teachers College	H. L. Donovan
Wilmore	Asbury College	Z. T. Johnson
Winchester	Kentucky Wesleyan College	Paul Shell Powell
Louisiana		
Lafayette	Southwestern Louisiana Institute	Lether E. Frazar
Natchitoches	Louisiana State Normal College	A. A. Fredericks
New Orleans	Dillard University	William S. Nelson
New Orleans	Loyola University	Harold A. Gaudin
New Orleans	Newcomb College	Frederick Hard, Dean
New Orleans	St. Mary's Dominican College	Sister Mary Vincent
New Orleans	Tulane University of Louisiana	Rufus C. Harris
New Orleans	Ursuline College	Mother Mary B. Bonhomme
New Orleans	Xavier University	Mother M. Agatha
Pineville	Louisiana College	Claybrook Cottingham
Ruston	Louisiana Polytechnic Institute	E. S. Richardson
Scotlandville	Southern University	Felton Clark
Shreveport	Centenary College	Pierce Cline
University	Louisiana State University and Agricultural & Mechanical College	James M. Smith
Maine		
Brunswick	Bowdoin College	Kenneth C. M. Sills
Castine	Eastern State Normal School	William D. Hall
Farmington	State Normal School	Wilbert G. Mallett
Fort Kent	Madawaska Training School	Richard F. Crocker
Gorham	Western State Normal School	Walter E. Russell
Lewiston	Bates College	Clifton D. Gray
Machias	Washington State Normal School	Philip H. Kimball
Orono	University of Maine	Arthur A. Hauck
Presque Isle	Aroostook State Normal School	San L. Merriman
Waterville	Colby College	Franklin W. Johnson
Maryland		
Annapolis	St. John's College	Stringfellow Barr
Annapolis	United States Naval Academy	Wilson Brown, Supt.
Baltimore	College of Notre Dame of Maryland	Sister M. Frances
Baltimore	Goucher College	David A. Robertson
Baltimore	Johns Hopkins University	Isaiah Bowman
Baltimore	Loyola College	Edward B. Bunn
Baltimore	Morgan College	D. O. W. Holmes
Baltimore	St. Mary's Seminary & University	John F. Fenlon
Bowie	State Teachers College	L. S. James
Chestertown	Washington College	Gilbert W. Mead
College Park	University of Maryland	H. C. Byrd
Emmitsburg	Mount St. Mary's College	John L. Sheridan
Emmitsburg	St. Joseph's College	Sister Paula
Frederick	Hood College	Henry I. Stahr
Frostburg	State Teachers College	John L. Dunkle
Lutherville	Maryland College for Women	Frederick E. Metzger
New Windsor	Blue Ridge College	W. R. Slack, Dean
Salisbury	State Teachers College	J. D. Blackwell
Towson	State Teachers College	M. Theresa Wiedefeld
Westminster	Western Maryland College	F. G. Holloway
Massachusetts		
Amherst	Amherst College	Stanley King
Amherst	Massachusetts State College	Hugh P. Baker
Boston	Boston University	Daniel L. Marsh
Boston	Massachusetts College of Pharmacy	H. C. Newton, Dean
Boston	Northeastern University	Frank P. Speare
Boston	Portia College	A. Chesley York
Boston	Simmons College	Bancroft Beatley
Boston	Suffolk University	Gleason L. Archer
Boston	Teachers College of the City of Boston	Wm. H. J. Kennedy
Bridgewater	State Teachers College	John J. Kelly
Cambridge	Harvard University	James B. Conant
Cambridge	Massachusetts Institute of Technology	Karl T. Compton
Cambridge	Radcliffe College	Ada L. Comstock
Chestnut Hill	Boston College	Wm. J. McGarry
Fitchburg	State Teachers College	Charles M. Herlihy
Framingham	State Teachers College	M. F. O'Connor
Hyannis	State Teachers College	Herbert H. Howes
Lowell	Lowell Textile Institute	Charles H. Eames
Lowell	State Teachers College	James Dugan
Medford	Tufts College	Leonard Carmichael
Newton Center	Andover Newton Theological School	Everett C. Herrick
North Adams	State Teachers College	Grover C. Bowman
Northampton	Smith College	William A. Neilson
Norton	Wheaton College	John Edgar Park
Salem	State Teachers College	Edward A. Sullivan
South Hadley	Mount Holyoke College	Roswell G. Ham
South Lancaster	Atlantic Union College	G. Eric Jones
Springfield	American International College	C. S. McGowan
Springfield	Springfield College	Ernest M. Best
Waltham	Middlesex University	C. Ruggles Smith
Wellesley	Wellesley College	Mildred H. McAfee
Westfield	State Teachers College	Edw. J. Scanlon
Weston	Regis College	Sister Genevieve Marie
Williamstown	Williams College	J. P. Baxter, 3rd
Worcester	Clark University	Wallace W. Atwood
Worcester	College of the Holy Cross	Francis J. Dolan
Worcester	State Teachers College	Wm. B. Aspinwall
Worcester	Worcester Polytechnic Institute	Ralph Earle
Michigan		
Adrian	Adrian College	Harlan L. Feeman
Adrian	St. Joseph's College	Mother M. Gerald
Albion	Albion College	John L. Seaton
Alma	Alma College	John Wirt Dunning
Ann Arbor	University of Michigan	Alex. G. Ruthven
Battle Creek	Battle Creek College	Emil Leffler
Berrien Springs	Emmanuel Missionary College	H. J. Klooster
Big Rapids	Ferris Institute	M. S. Ward
Detroit	Detroit College of Law	Charles B. Van Duesen
Detroit	Detroit Institute of Technology	Paul Hickey
Detroit	Marygrove College	Sister M. Honora
Detroit	Sacred Heart Seminary	Daniel J. Ryan
Detroit	University of Detroit	A. H. Poetker
Detroit	Wayne University	Frank Cody
East Lansing	Michigan State College of Agriculture and Applied Science	Robert S. Shaw
Grand Rapids	Calvin College	Ralph Stob
Hillsdale	Hillsdale College	Willfred Mauck
Holland	Hope College	Wynand Wichers

City	Institution	President
Houghton	Michigan College of Mining and Technology	Grover C. Dillman
Kalamazoo	Kalamazoo College	Paul L. Thompson
Kalamazoo	Western State Teachers College	Paul V. Sangren
Marquette	Northern State Teachers College	Webster H. Pearce
Mt. Pleasant	Central State Teachers College	E. C. Warriner
Nazareth	Nazareth College	Sister Mary Kevin
Olivet	Olivet College	Joseph Brewer
Orchard Lake	St. Mary College	L. J. Krzyzosiak
Ypsilanti	Michigan State Normal College	J. M. Munson

Minnesota

Bemidji	State Teachers College	C. R. Sattgast
Collegeville	St. John's University	Alcuin Deutsch
Duluth	College of St. Scholastic	Mother M. Agnes Somers
Duluth	Duluth State Teachers College	Herbert Sorenson
Mankato	State Teachers College	Frank D. McElroy
Minneapolis	Augsburg College and Theological Seminary	Bernhard Christensen
Minneapolis	University of Minnesota	Guy Stanton Ford
Moorhead	Concordia College	J. N. Brown
Moorhead	Moorhead State Teachers College	R. B. MacLean
New Ulm	Dr. Martin Luther College	Carl L. Schweppe
Northfield	Carleton College	Donald J. Cowling
Northfield	St. Olaf College	L. W. Boe
St. Cloud	State Teachers College	George A. Selke
St. Joseph	College of St. Benedict	Sister Rosamond Pratscher
St. Paul	Bethel Institute	G. A. Hagstrom
St. Paul	College of St. Catherine	Sister Eucharista
St. Paul	College of St. Thomas	James H. Moynihan
St. Paul	Hamline University	Charles N. Pace
St. Paul	Macalester College	
St. Peter	Gustavus Adolphus College	O. J. Johnson
Winona	College of St. Teresa	Sister Mary A. Molloy
Winona	St. Mary's College	Brother Leopold
Winona	Winona State Teachers College	Guy E. Maxwell

Mississippi

Alcorn	Alcorn Agricultural & Mechanical College	Wm. H. Bell
Blue Mountain	Blue Mountain College	Lawrence T. Lowrey
Cleveland	Delta State Teachers College	W. M. Kethley
Clinton	Mississippi College	D. M. Nelson
Columbus	Mississippi State College for Women	B. L. Parkinson
Hattiesburg	Mississippi Woman's College	W. E. Holcomb
Hattiesburg	State Teachers College	J. B. George
Holly Springs	Rust College	L. M. McCoy
Jackson	Belhaven College	G. T. Gillespie
Jackson	Jackson College	B. Baldwin Dansby
Jackson	Millsaps College	M. L. Smith
State College	Mississippi State College	G. D. Humphrey
Tougaloo	Tougaloo College	Judson L. Cross
University	University of Mississippi	A. B. Butts, Chancellor

Missouri

Canton	Culver Stockton College	W. H. McDonald
Cape Girardeau	Southeast Missouri State Teachers College	Walter W. Parker
Columbia	University of Missouri	F. A. Middlebush
Fayette	Central College	Robert H. Ruff
Fulton	Westminster College	F. L. McCluer
Jefferson City	Lincoln University	Sherman D. Scruggs
Kansas City	Kansas City College of Osteopathy & Surgery	Geo. J. Conley
Kansas City	Kansas City-Western Dental College	R. J. Rinehart, Dean
Kansas City	Rockhurst College	Daniel H. Conway
Kansas City	Teachers College of Kansas City	J. C. Bond
Kansas City	University of Kansas City	Clarence R. Decker
Kirksville	Kirksville College of Osteopathy & Surgery	Geo. M. Laughlin
Kirksville	Northeast Missouri State Teachers College	Walter H. Ryle
Liberty	William Jewell College	John F. Herget
Marshall	Missouri Valley College	Thos. Wm. Bibb
Maryville	Northwest Missouri State Teachers College	Uel W. Lamkin
Parkville	Park College	Wm. Lindsay Young
St. Charles	Lindenwood College	John L. Roemer
St. Louis	Concordia Theological Seminary	L. Fuerbringer
St. Louis	Harris Teachers College	C. G. Vannest
St. Louis	Maryville College	Mother M. O. Mouton
St. Louis	St. Louis College of Pharmacy	Robert L. Lund
St. Louis	St. Louis University	H. B. Crimmins
St. Louis	Stowe Teachers College	Ruth Harris, Chmn.
St. Louis	Washington University	George R. Throop, Chancellor
Springfield	Drury College	T. W. Nadal
Springfield	Southwest Missouri State Teachers College	Roy Ellis
Tarkio	Tarkio College	M. E. Collins
Warrensburg	Central Missouri State Teachers College	G. W. Diemer
Webster Groves	Webster College	George F. Donovan

Montana

Billings	Eastern Montana State Normal School	L. B. McMullen
Billings	Intermountain Union College	J. S. Pennepacker, Dean
Bozeman	Montana State College	A. L. Strand
Butte	Montana School of Mines	Francis A. Thomson
Dillon	Montana State Normal College	Sheldon E. Davis
Helena	Carroll College	Emmet Riley
Missoula	Montana State University	George F. Simmons
Polytechnic	Billings Polytechnic Institute	Ernest T. Eaton

Nebraska

Blair	Dana College	Lawrence Siersbeck
Central City	Nebraska Central College	O. W. Carrell
Chadron	Nebraska State Teachers College	Robert I. Elliott
Crete	Doane College	Bryan S. Stoffer
Fremont	Midland College	H. F. Martin
Hastings	Hastings College	J. W. Creighton
Kearney	State Teachers College	Herbert L. Cushing
Lincoln	Nebraska Wesleyan University	Benjamin F. Schwartz
Lincoln	Union College	A. H. Rulkoetter
Lincoln	University of Nebraska	C. S. Boucher, Chancellor
Omaha	Creighton University	Joseph P. Zuercher
Omaha	Duchesne College	Mother Eleanor Regan
Omaha	University of Omaha	Rowland Haynes
Peru	Nebraska State Teachers College	W. R. Pate
Seward	Concordia Teachers College	C. F. Brommer
Wayne	State Teachers College	J. T. Anderson
York	York College	D. E. Weidler

Nevada

Reno	University of Nevada	Leon W. Hartman, Acting

New Hampshire

Durham	University of New Hampshire	Fred Engelhardt
Hanover	Dartmouth College	Ernest M. Hopkins
Hudson	Rivier College	Sister Marie Madeleine
Keene	Keene Normal School	Wallace E. Mason
Manchester	St. Anselm's College	Bertrand C. Dolan
Plymouth	Plymouth Normal School	Ernest L. Silver

New Jersey

Convent Station	College of St. Elizabeth	Sister Marie Jose Byrne, Dean
East Orange	Panzer College of Physical Education and Hygiene	Margaret C. Brown
East Orange	Upsala College	Frans Ericsson, Acting
Glassboro	New Jersey State Teachers College	Edgar F. Bunce
Hoboken	Stevens Institute of Technology	Harvey N. Davis
Jersey City	New Jersey State Teachers College	Roy L. Shaffer
Jersey City	St. Peter's College	Denis J. Comey
Lakewood	Georgian Court College	Mother Mary Cecelia Scully
Madison	Drew University	Arlo Ayres Brown
Montclair	New Jersey State Teachers College	Harry A. Sprague
Newark	Newark College of Engineering	Allan R. Cullimore
Newark	New Jersey State Teachers College	M. Ernest Townsend
Newark	University of Newark	Frank Kingdon
New Brunswick	New Jersey College for Women	Margaret T. Corwin, Dean
New Brunswick	Rutgers University	Robert C. Clothier
Paterson	New Jersey State Teachers College	C. S. Wightman
Princeton	Princeton Theological Seminary	John A. Mackay
Princeton	Princeton University	Harold W. Dodds
Princeton	St. Joseph's College	Arthur DeC. Hamilton
South Orange	Seton Hall College	James Kelley
Trenton	State Teachers College	Roscoe L. West
Zarephath	Alma White College	Arthur K. White

City	Institution	President
New Mexico		
Albuquerque	University of New Mexico	J. F. Zimmerman
El Rito	Spanish-American Normal School	Joseph B. Grant
Las Vegas	New Mexico Normal University	H. C. Gossard
Silver City	New Mexico State Teachers College	H. W. James
Socorro	New Mexico School of Mines	E. H. Wells
State College	New Mexico State College of Agriculture & Mechanic Arts	Hugh M. Milton II
New York		
Albany	College of St. Rose	Edmund F. Gibbons
Albany	State College for Teachers	A. R. Brubacher
Alfred	Alfred University	J. Nelson Norwood
Annandale-on-Hudson	Bard College, Columbia University	Harold Mestre, Dean
Auburn	Auburn Theological Seminary	Paul Silas Heath
Aurora	Wells College	William E. Weld
Brockport	State Normal School	E. C. Hartwell
Bronxville	Sarah Lawrence College	Constance Warren
Brooklyn	Brooklyn College	Mario E. Cosenza, Acting
Brooklyn	Long Island University	Tristram W. Metcalfe, Dean
Brooklyn	Polytechnic Institute of Brooklyn	Harry S. Rogers
Brooklyn	Saint Francis College	Brother Columba
Brooklyn	St. John's University	Edward J. Walsh
Buffalo	Canisius College	Francis A. O'Malley
Buffalo	D'Youville College	Sister Grace of the Sacred Heart
Buffalo	State Teachers College	Harry W. Rockwell
Buffalo	University of Buffalo	Samuel Paul Capen, Chancellor
Canton	St. Lawrence University	Laurens H. Seelye
Clinton	Hamilton College	W. H. Cowley
Cortland	Cortland Normal School	H. DeW. DeGroat
Elmira	Elmira College	W. S. A. Pott
Flushing	Queens College	Paul Klapper
Fredonia	State Normal School	L. R. Gregory
Garden City	Adelphi College	Paul Dawson Eddy
Geneseo	State Normal School	James B. Welles
Geneva	Hobart College	William A. Eddy
Hamilton	Colgate University	George B. Cutten
Houghton	Houghton College	Stephen W. Paine
Ithaca	Cornell University	Edmund Ezra Day
Ithaca	Ithaca College	Leonard Bliss Job
Keuka Park	Keuka College	J. Hillis Miller
New Paltz	State Normal School	L. H. van den Berg
New Rochelle	College of New Rochelle	Francis W. Walsh
New York	Barnard College	Virginia C. Gildersleeve, Dean
New York	Biblical Seminary in New York	J. Campbell White, Acting
New York	College of the City of New York	F. B. Robinson
New York	College of Mount St. Vincent	
New York	Columbia University	Nicholas M. Butler
New York	Cooper Union	Gano Dunn
New York	Fordham University	Robert I. Gannon
New York	General Theological Seminary	H. Fosbroke, Dean
New York	Hunter College of the City of N.Y.	Eugene A. Colligan
New York	Jewish Theological Seminary of America	Cyrus Adler
New York	Manhattan College	Brother A. Victor
New York	Manhattanville College of The Sacred Heart	Mother Grace C. Dammann
New York	New York Medical College	Claude A. Burrett, Dean
New York	New York University	Harry W. Chase, Chancellor
New York	Savage School for Physical Education	Ella W. Savage
New York	Teachers College, Columbia University	Wm. F. Russell, Dean
New York	Union Theological Seminary	Henry S. Coffin
New York	Yeshiva College	Bernard Revel
Niagara University	Niagara University	Joseph M. Noonan
Oneonta	Hartwick College	Chas. W. Leitzell
Oneonta	State Normal School	Chas. W. Hunt
Oswego	State Normal School	Ralph W. Swetman
Plattsburgh	Plattsburgh State Normal School	Charles C. Ward
Potsdam	Clarkson College of Technology	James Shelby Thomas
Potsdam	State Normal School	R. T. Congdon
Poughkeepsie	Vassar College	H. N. MacCracken
Rochester	Nazareth College of Rochester	Mother Sylvester
Rochester	The Colgate-Rochester Divinity School	Albert W. Beaven
Rochester	University of Rochester	Alan Valentine
St. Bonaventure	St. Bonaventure College	Thomas Plassmann
Saratoga Springs	Skidmore College	Henry T. Moore
Schenectady	Union College	Dixon Ryan Fox
Staten Island	Wagner Memorial Lutheran College	Clarence C. Stoughton
Syracuse	New York State College of Forestry	Samuel N. Spring, Dean
Syracuse	Syracuse City Normal School	Wm. W. Wright
Syracuse	Syracuse University	W. P. Graham, Chancellor
Tarrytown	Marymount College	Mother M. Gerard
Troy	Rensselaer Polytechnic Institute	Wm. O. Hotchkiss
Troy	Russell Sage College	J. L. Meader
West Point	United States Military Academy	J. L. Benedict
White Plains	Good Counsel College	Mother M. Aloysia
North Carolina		
Asheville	Asheville Normal & Teachers College	Frank Foster, Dean
Boone	Appalachian State Teachers College	B. B. Dougherty
Chapel Hill	University of North Carolina	Frank P. Graham
Charlotte	Johnson C. Smith University	H. L. McCrorey
Charlotte	Queens-Chicora College	W. H. Frazer
Cullowhee	Western Carolina Teachers College	H. T. Hunter
Davidson	Davidson College	Walter L. Lingle
Durham	Duke University	Wm. Preston Few
Durham	North Carolina College for Negroes	James E. Shepard
Elizabeth City	State Normal School	J. H. Bias
Elon College	Elon College	Leon E. Smith
Fayetteville	State Normal School	J. W. Seabrook
Greensboro	Agricultural & Technical College	F. D. Bluford
Greensboro	Bennett College	David D. Jones
Greensboro	Greensboro College	Luther L. Gobbel
Greensboro	Woman's College of the University of North Carolina	Frank Porter Graham
Greenville	East Carolina Teachers College	Leon R. Meadows
Guilford College	Guilford College	Clyde A. Milner
Hickory	Lenoir Rhyne College	P. E. Monroe
High Point	High Point College	G. I. Humphreys
Raleigh	Meredith College	Charles E. Brewer
Raleigh	North Carolina State College of Agriculture & Engineering, University of North Carolina	John W. Harrelson, Dean
Raleigh	St. Augustine's College	Edgar H. Goold
Raleigh	Shaw University	Robert P. Daniel
Red Springs	Flora MacDonald College	Henry G. Bedinger
Salisbury	Catawba College	Howard R. Omwake
Salisbury	Livingstone College	W. J. Trent
Wake Forest	Wake Forest College	Thurman D. Kitchin
Wilson	Atlantic Christian College	H. S. Hilley
Winston-Salem	Salem College	H. E. Rondthaler
Winston-Salem	Winston-Salem Teachers College	F. L. Atkins
North Dakota		
Dickinson	State Teachers College	E. S. Hatch, Acting
Ellendale	State Normal & Industrial School	J. C. McMillan
Fargo	North Dakota Agricultural College	Frank L. Eversull
Grand Forks	University of North Dakota	John C. West
Grand Forks	Wesley College	Charles L. Wallace
Jamestown	Jamestown College	B. H. Kroeze
Mayville	State Teachers College	Cyril Grace
Minot	State Teachers College	Carl C. Swain
Valley City	State Teachers College	James E. Cox
Ohio		
Ada	Ohio Northern University	Robert Williams
Akron	University of Akron	H. E. Simmons
Alliance	Mount Union College	Charles Burgess Ketcham
Ashland	Ashland College	Charles L. Anspach
Athens	Ohio University	Herman G. James
Berea	Baldwin-Wallace College	Louis Clinton Wright
Bluffton	Bluffton College	Lloyd L. Ramseyer
Bowling Green	Bowling Green State University	R. E. Offenhauer
Cedarville	Cedarville College	W. R. McChesney
Cincinnati	Teachers College, Athenaeum of Ohio	Carl J. Ryan, Dean
Cincinnati	University of Cincinnati	Raymond Walters
Cincinnati	Xavier University	Dennis F. Burns
Cleveland	John Carroll University	Edmund C. Horne
Cleveland	Case School of Applied Science	Wm. E. Wickenden
Cleveland	Fenn College	C. V. Thomas
Cleveland	Ursuline College	Mary Concepta Green
Cleveland	Western Reserve University	W. G. Leutner
Columbus	Capital University	Otto Mees
Columbus	Ohio State University	William McPherson, Acting
Columbus	St. Mary of the Springs College	Sister M. Aloyse
Dayton	University of Dayton	John A. Elebert
Defiance	Defiance College	John W. Claxton

City	Institution	President
Delaware	Ohio Wesleyan University	Edward L. Rice
Findlay	Findlay College	H. R. Dunathan
Gambier	Kenyon College	Gordon K. Chalmers
Granville	Denison University	A. A. Shaw
Hiram	Hiram College	Kenneth I. Brown
Kent	Kent State University	K. C. Leebrick
Manchester	Alfred Holbrook College	H. E. Cunningham
Marietta	Marietta College	Harry K. Eversull
Mount St. Joseph	College of Mount St. Joseph	Mother Mary Regina
New Concord	Muskingum College	R. N. Montgomery
Oberlin	Oberlin College	Ernest H. Wilkins
Oxford	Miami University	A. H. Upham
Oxford	Western College	Ralph K. Hickok
Painesville	Lake Erie College	Vivian B. Small
South Euclid	Notre Dame College	Mother Mary Evarista
Springfield	Wittenberg College	Rees Edgar Tulloss
Tiffin	Heidelberg College	Clarence E. Josephson
Toledo	Mary Manse College	Sister Catherine Raynor
Toledo	De Sales College	F. J. Macelwane
Toledo	University of the City of Toledo	Philip Curtis Nash
Westerville	Otterbein College	W. G. Clippinger
Wilberforce	Wilberforce University	D. O. Walker
Wilmington	Wilmington College	Walter L. Collins
Wooster	The College of Wooster	Charles F. Wishart
Yellow Springs	Antioch College	A. D. Henderson
Youngstown	Youngstown College	Howard W. Jones

Oklahoma

Ada	East Central State Teachers College	A. Linscheid
Alva	Northwestern Teachers College	Ernest E. Brown
Bethany	Bethany-Peniel College	A. K. Bracken
Chickasha	Oklahoma College for Women	M. A. Nash
Durant	Southeastern State Teachers College	H. Vance Posey
Edmond	Central State Teachers College	John O. Moseley
Enid	Phillips University	Eugene S. Briggs
Goodwell	Panhandle Agricultural & Mechanical College	Edward L. Morrison
Guthrie	Catholic College of Oklahoma for Women	Mother Mary Agnes Arvin
Langston	Colored Agricultural & Normal University	J. W. Sanford
Norman	University of Oklahoma	Wm. B. Bizzell
Oklahoma City	Oklahoma City University	A. G. Williamson
Shawnee	Oklahoma Baptist University	John W. Raley
Stillwater	Oklahoma Agricultural & Mechanical College	Henry G. Bennett
Tahlequah	Northeastern State Teachers College	John Vaughan
Tulsa	University of Tulsa	C. I. Pontius
Weatherford	Southwestern State Teachers College	W. W. Isle

Oregon

Ashland	Southern Oregon State Normal School	Walter Redford
Corvallis	Oregon State College	George W. Peavy
Eugene	University of Oregon	Donald Milton Erb
Forest Grove	Pacific University	John F. Dobbs
La Grande	Eastern Oregon Normal School	C. A. Howard
McMinnville	Linfield College	William Graham Everson
Monmouth	Oregon Normal School	J. A. Churchill
Newberg	Pacific College	Levi T. Pennington
Oswego	Marylhurst College	Sister M. Elizabeth Clare
Portland	North Pacific College	Herbert C. Miller
Portland	Reed College	Dexter M. Keezer
Portland	University of Portland	Michael J. Early
Salem	Willamette University	Bruce R. Baxter

Pennsylvania

Allentown	Cedar Crest College	Wm. F. Curtis
Allentown	Muhlenberg College	Levering Tyson
Annville	Lebanon Valley College	Clyde A. Lynch
Beaver Falls	Geneva College	M. M. Pearce
Bethlehem	Lehigh University	Clement C. Williams
Bethlehem	Moravian College and Theological Seminary	Wm. N. Schwarze
Bethlehem	Moravian College for Women	Edwin J. Heath
Bloomsburg	State Teachers College	Francis B. Haas
Bryn Athyn	Academy of the New Church	George de Charms
Bryn Mawr	Bryn Mawr College	Marion E. Park
California	California State Teachers College	Robert M. Steele
Carlisle	Dickinson College	Fred P. Corson
Chambersburg	Wilson College	Paul S. Havens
Chester	Crozer Theological Seminary	James H. Franklin
Chester	Pennsylvania Military College	Frank K. Hyatt
Chestnut Hill	Chestnut Hill College	Sister Maria Kostka, Dean
Cheyney	State Teachers College	L. P. Hill
Clarion	State Teachers College	Paul G. Chandler
Collegeville	Ursinus College	N. E. McClure
Dallas	College Misericordia	Sister M. Teresa
Easton	Lafayette College	Wm. Mather Lewis
East Stroudsburg	State Teachers College	T. T. Allen
Edinboro	State Teachers College	Carmon A. Ross
Elizabethtown	Elizabethtown College	Ralph W. Schlosser
Erie	Mercyhurst College	Sister M. Xavier O'Neil
Erie	Villa Maria College	Joseph J. Wehrle
Gettysburg	Gettysburg College	H. W. A. Hanson
Greensburg	Seton Hill College	J. A. W. Reeves
Greenville	Thiel College	Earl S. Rudisill
Grove City	Grove City College	Weir C. Ketler
Haverford	Haverford College	W. W. Comfort
Huntingdon	Juniata College	Charles C. Ellis
Immaculata	Immaculata College	Francis J. Furey
Indiana	Indiana State Teachers College	Samuel Fausold
Jenkintown	Beaver College	W. B. Greenway
Kutztown	State Teachers College	Quincy A. W. Rohrbach
Lancaster	Franklin & Marshall College	John A. Schaeffer
Latrobe	St. Vincent College	Alfred Koch
Lewisburg	Bucknell University	Arnaud C. Marts
Lincoln Univ.	Lincoln University	Walter L. Wright
Lock Haven	State Teachers College	John G. Flowers
Loretto	St. Francis College	Edw. P. M. Caraher
Mansfield	Mansfield State Teachers College	Joseph F. Noonan
Meadville	Allegheny College	Wm. P. Tolley
Millersville	State Teachers College	Landis Tanger
New Wilmington	Westminster College	Robert F. Galbreath
Philadelphia	Drexel Institute of Technology	Parke R. Kolbe
Philadelphia	Dropsie College	Cyrus Adler
Philadelphia	Hahnemann Medical College	Joseph S. Conwell
Philadelphia	Jefferson Medical College	Henry K. Mohler, Dean
Philadelphia	La Salle College	Brother E. Anselm
Philadelphia	Philadelphia College of Osteopathy	Edgar O. Holden
Philadelphia	Philadelphia College of Pharmacy & Science	Wilmer Krusen
Philadelphia	St. Joseph's College	Thomas J. Higgins
Philadelphia	Temple University	Charles E. Beury
Philadelphia	University of Pennsylvania	Thomas S. Gates
Philadelphia	Women's Medical College of Pennsylvania	Chevalier Jackson
Pittsburgh	Carnegie Institute of Technology	R. E. Doherty
Pittsburgh	Duquesne University	J. J. Callahan
Pittsburgh	Mount Mercy College	Mother M. Irenaeus Dougherty
Pittsburgh	Pennsylvania College for Women	Herbert L. Spencer
Pittsburgh	University of Pittsburgh	John G. Bowman, Chancellor
Reading	Albright College	Harry V. Masters
Rosemont	Rosemont College	Mother Mary Ignatius
Scranton	Marywood College	Mother M. Josepha
Scranton	University of Scranton	Brother D. Edward
Selinsgrove	Susquehanna University	G. Morris Smith
Shippensburg	State Teachers College	A. L. Rowland
Slippery Rock	State Teachers College	C. S. Miller
State College	Pennsylvania State College	Ralph D. Hetzel
Swarthmore	Swarthmore College	Frank Aydelotte
Villanova	Villanova College	E. V. Stanford
Washington	Washington & Jefferson College	Ralph Cooper Hutchison
Waynesburg	Waynesburg College	Paul R. Stewart
West Chester	State Teachers College	Charles S. Swope

Rhode Island

Kingston	Rhode Island State College	Raymond G. Bressler
Providence	Brown University	Henry M. Wriston
Providence	Providence College	John J. Dillon
Providence	Rhode Island College of Education	John L. Alger
Providence	Rhode Island College of Pharmacy and Allied Sciences	A. W. Claflin

South Carolina

Charleston	The Citadel—The Military College of South Carolina	Chas. P. Summerall
Charleston	College of Charleston	Harrison Randolph
Charleston	Medical College of the State of South Carolina	Robert Wilson
Clemson College	Clemson Agricultural College	Enoch W. Sikes
Clinton	Presbyterian College	William P. Jacobs
Columbia	Allen University	E. H. McGill
Columbia	Benedict College	J. J. Starks
Columbia	Columbia College	J. Caldwell Guilds
Columbia	University of South Carolina	J. R. McKissick

City	Institution	President
Due West	Erskine College	Robert C. Grier
Gaffney	Limestone College	R. C. Granberry
Greenville	Furman University	B. E. Geer
Greenwood	Lander College	J. W. Speake
Hartsville	Coker College	C. Sylvester Green
Newberry	Newberry College	James C. Kinard
Orangeburg	Claflin College	J. B. Randolph
Orangeburg	State Agricultural and Mechanical College	M. F. Whittaker
Rock Hill	Winthrop College	Shelton Phelps
Spartanburg	Converse College	Edward M. Gwathmey
Spartanburg	Wofford College	Henry N. Snyder

South Dakota

Aberdeen	Northern State Teachers College	Carl G. Lawrence
Brookings	South Dakota State College of Agriculture & Mechanic Arts	C. W. Pugsley
Huron	Huron College	Herbert G. Titt, Acting
Madison	Eastern State Normal School	V. A. Lowry
Mitchell	Dakota Wesleyan University	Joseph H. Edge
Rapid City	State School of Mines	Joseph P. Connolly
Sioux Falls	Augustana College	Clemens M. Granskou
Sioux Falls	Sioux Falls College	Warren Palmer Behan
Spearfish	Spearfish Normal School	E. C. Woodburn
Springfield	Southern State Normal School	W. A. Thompson
Vermillion	University of South Dakota	I. D. Weeks
Yankton	Yankton College	G. W. Nash

Tennessee

Bristol	King College	Thomas P. Johnston
Chattanooga	University of Chattanooga	Archie M. Palmer
Clarksville	Austin Peay Normal School	P. P. Claxton
Cookeville	Tennessee Polytechnic Institute	Q. M. Smith
Greeneville	Tusculum College	C. A. Anderson
Harrogate	Lincoln Memorial University	S. W. McClelland
Jackson	Lambuth College	Richard E. Womack
Jackson	Lane College	J. F. Lane
Jackson	Union University	John J. Hurt
Jefferson City	Carson-Newman College	James T. Warren
Johnson City	State Teachers College	C. C. Sherrod
Knoxville	Knoxville College	S. M. Laing
Knoxville	The University of Tennessee	James D. Hoskins
Lebanon	Cumberland University	Ernest L. Stockton
Madison College	Madison College	E. A. Sutherland
Maryville	Maryville College	Ralph Waldo Lloyd
McKenzie	Bethel College	L. L. Thomas
Memphis	Southwestern	Charles E. Diehl
Memphis	State Teachers College	J. W. Brister
Milligan College	Milligan College	H. J. Derthick
Murfreesboro	State Teachers College	Q. M. Smith
Murfreesboro	Tennessee College	E. L. Atwood
Nashville	Fisk University	Thomas E. Jones
Nashville	George Peabody College for Teachers	S. C. Garrison
Nashville	Scarritt College	Jesse Lee Cuninggim
Nashville	Tennessee Agricultural & Industrial State College	W. J. Hale
Nashville	Vanderbilt University	O. C. Carmichael
Sewanee	University of the South	Alexander Guerry

Texas

Abilene	Abilene Christian College	James F. Cox
Abilene	Hardin-Simmons University	J. D. Sandefer
Abilene	McMurry College	T. W. Brabham
Alpine	Sul Ross State Teachers College	H. W. Morelock
Austin	Samuel Huston College	Stanley E. Grannum
Austin	St. Edward's University	P. J. Haggerty
Austin	Tillotson College	Mary E. Branch
Austin	The University of Texas	John Wm. Calhoun
Belton	Mary Hardin-Baylor College	Gordon G. Singleton
Brownwood	Daniel Baker College	Robert Guy Davis
Brownwood	Howard Payne College	Thomas H. Taylor
Canyon	West Texas State Teachers College	J. A. Hill
College Station	Agricultural & Mechanical College of Texas	T. O. Walton
Commerce	East Texas State Teachers College	Sam H. Whitley
Dallas	Southern Methodist University	Umphrey Lee
Denton	North Texas State Teachers College	W. J. McConnell
Denton	Texas State College for Women	Louis H. Hubbard
El Paso	Texas College of Mines and Metallurgy	D. M. Wiggins
Fort Worth	Texas Christian University	Edward McS. Waits
Fort Worth	Texas Wesleyan College	Law Sone
Georgetown	Southwestern University	J. W. Bergin
Houston	The Rice Institute	Edgar Odell Lovett
Huntsville	Sam Houston State Teachers College	C. N. Shaver
Kingsville	Texas College of Arts & Industries	J. O. Loftin
Lubbock	Texas Technological College	
Marshall	Bishop College	Joseph J. Rhoads
Marshall	Wiley College	M. W. Dogan
Nacogdoches	Stephen F. Austin State Teachers College	A. W. Birdwell
Prairie View	Prairie View State College	W. R. Banks
San Antonio	Incarnate Word College	Sister M. Columkille
San Antonio	Our Lady of the Lake College	H. A. Constantineau
San Antonio	St. Mary's University of San Antonio	Walter Golatka
San Marcos	Southwest Texas State Teachers College	C. E. Evans
Seguin	Guadalupe College	J. R. Lockett
Sherman	Austin College	Everett B. Tucker
Tyler	Texas College	D. R. Glass
Waco	Baylor University	Pat M. Neff
Waco	Paul Quinn College	A. S. Jackson
Waxahachie	Trinity University	F. L. Wear

Utah

Logan	Utah State Agricultural College	Elmer G. Peterson
Provo	Brigham Young University	Franklin S. Harris
Salt Lake City	College of St. Mary-of-the-Wasatch	Sister Mary Veronique
Salt Lake City	University of Utah	George Thomas

Vermont

Bennington	Bennington College	Robert D. Leigh
Burlington	Trinity College	Sister Mary Emmanuel
Burlington	University of Vermont	Guy W. Bailey
Castleton	State Normal School	Caroline S. Woodruff
Johnson	State Normal School	Donald W. McClelland
Middlebury	Middlebury College	Paul D. Moody
Northfield	Norwich University	John M. Thomas, Acting
Winooski Park	St. Michael's College	L. E. Gosselin

Virginia

Alexandria	Protestant Episcopal Theological Seminary	W. E. Rollins
Ashland	Randolph-Macon College	S. C. Hatcher, Acting
Blacksburg	Virginia Polytechnic Institute	Julian A. Burruss
Bridgewater	Bridgewater College	Paul H. Bowman
Charlottesville	University of Virginia	John Lloyd Newcomb
East Radford	State Teachers College	David W. Peters
Emory	Emory & Henry College	J. N. Hillman
Ettrick	Virginia State College for Negroes	John M. Gandy
Farmville	State Teachers College	J. L. Jarman
Fredericksburg	Mary Washington College	Morgan L. Combs
Hampden-Sydney	Hampden-Sydney College	J. D. Eggleston
Hampton	Hampton Institute	Arthur Howe
Harrisonburg	Madison College	S. P. Duke
Hollins College	Hollins College	Bessie C. Randolph
Lawrenceville	St. Paul Normal and Industrial School	J. A. Russell
Lexington	Virginia Military Institute	Chas. E. Kilbourne, Supt.
Lexington	Washington & Lee University	Francis P. Gaines
Lynchburg	Lynchburg College	R. B. Montgomery
Lynchburg	Randolph-Macon Woman's College	Theo. Henley Jack
Lynchburg	Virginia Theological Seminary and College	W. H. R. Powell
Richmond	Medical College of Virginia	William T. Sanger
Richmond	University of Richmond	F. W. Boatwright
Richmond	Virginia Union University	William J. Clark
Salem	Roanoke College	Chas. J. Smith
Staunton	Mary Baldwin College	L. Wilson Jarman
Sweet Briar	Sweet Briar College	Meta Glass
Williamsburg	College of William & Mary	John Stewart Bryan

Washington

Bellingham	Western Washington College of Education	C. H. Fisher
Cheney	Eastern Washington College of Education	R. T. Hargreaves
College Place	Walla Walla College	George W. Bowers
Ellensburg	Central Washington College of Education	Rob't E. McConnell
Pullman	State College of Washington	Ernest O. Holland
Seattle	Seattle Pacific College	Charles H. Watson

City	Institution	President
Seattle	University of Washington	Lee Paul Sieg
Spokane	Gonzaga University	Leo J. Robinson
Spokane	Holy Names College of Education	Sister Esther Mary
Spokane	Whitworth College	Ward W. Sullivan
Tacoma	College of Puget Sound	Edward H. Todd
Walla Walla	Whitman College	Walter A. Bratton

West Virginia

Athens	Concord State Teachers College	J. Frank Marsh
Bethany	Bethany College	W. H. Cramblet
Bluefield	Bluefield State Teachers College	Henry Lake Dickason
Buckhannon	West Virginia Wesleyan College	Roy McCuskey
Charleston	Morris Harvey College	Leonard Riggleman
Elkins	Davis & Elkins College	Chas. E. Albert
Fairmont	Fairmont State Teachers College	Joseph Rosier
Glenville	Glenville State Teachers College	E. G. Rohrbough
Harpers Ferry	Storer College	H. T. McDonald
Huntington	Marshall College	James E. Allen
Institute	West Virginia State College	John W. Davis
Montgomery	New River State College	E. S. Maclin
Morgantown	West Virginia University	Charles E. Lawall, Acting
Philippi	Alderson-Broaddus College	E. J. Woofter
Salem	Salem College	S. Orestes Bond
Shepherdstown	Shepherd State Teachers College	W. H. S. White
West Liberty	West Liberty State Teachers College	Paul N. Elbin

Wisconsin

Appleton	Lawrence College	Thomas N. Barrows
Ashland	Northland College	J. D. Brownell
Beloit	Beloit College	Irving Maurer
Eau Claire	State Teachers College	H. A. Schofield
La Crosse	State Teachers College	Geo. M. Snodgrass
La Crosse	Viterbo College	Mother M. Seraphine Kraus
Madison	University of Wisconsin	Clarence A. Dykstra
Menomonie	The Stout Institute	Burton E. Nelson
Milton	Milton College	Jay W. Crofoot
Milwaukee	Marquette University	Raphael C. McCarthy
Milwaukee	Milwaukee-Downer College	Lucia R. Briggs
Milwaukee	Mount Mary College	Edw. A. Fitzpatrick
Milwaukee	State Teachers College	Frank E. Baker
Nashotah	Nashotah House	E. J. Nutter
Oshkosh	State Teachers College	Forrest R. Polk
Platteville	State Teachers College	Asa M. Royce
Plymouth	Mission House College	Paul Grosshuesch
Ripon	Ripon College	Silas Evans
River Falls	State Teachers College	J. H. Ames
Stevens Point	State Teachers College	Philip H. Falk
Superior	State Teachers College	Jim Dan Hill
Watertown	Northwestern College	Erwin E. Kowalke
Waukesha	Carroll College	Wm. A. Ganfield
West De Pere	St. Norbert College	B. H. Pennings
Whitewater	State Teachers College	C. M. Yoder

Wyoming

Laramie	University of Wyoming	Arthur G. Crane

Possessions

College, Alaska	University of Alaska	Charles E. Bunnell
Honolulu, Hawaii	University of Hawaii	David L. Crawford
Dumaguete, Philippine Islands	Silliman University	L. C. Winternheimer, Acting
Manila, Philippine Islands	De La Salle College	Brother Xavier
Manila, Philippine Islands	Mapua Institute of Technology	Tomas Mapua
Manila, Philippine Islands	Philippine Normal School	R. K. Gilmore, Supt.
Manila, Philippine Islands	University of the Philippines	Jorge Bocobo
Rio Piedras, Puerto Rico	University of Puerto Rico	Juan B. Soto
San Germán Puerto Rico	Polytechnic Institute of Puerto Rico	Jarvis S. Morris

Canada

Antigonish, N. S.	St. Francis Xavier University	D. J. MacDonald
Belleville, Ont.	Albert College	Bert Howard
Charlottetown, P. E. I.	St. Dunstan's College	J. A. Murphy
Edmonton, Alta.	University of Alberta	W. A. R. Kerr
Fredericton, N. B.	University of New Brunswick	C. C. Jones
Halifax, N. S.	Dalhousie University	Carleton Stanley
Halifax, N. S.	Halifax Ladies College	E. Florence Blackwood
Halifax, N. S.	University of King's College	A. Stanley Walker
Hamilton, Ont.	McMaster University	H. P. Whidden, Chancellor
Kingston, Ont.	Queen's University	R. C. Wallace
Kitchener, Ont.	St. Jerome's College	Wm. G. Borho
Lennoxville, Que.	Bishop's University	A. H. McGreer
London, Ont.	University of Western Ontario	Wm. Sherwood Fox
Montreal, Que.	Loyola College	H. C. McCarthy
Montreal, Que.	McGill University	Lewis W. Douglas
Quebec, Que.	Laval University	Arthur Robert
St. Joseph, N. B.	St. Joseph's University	L. LaPalme
St. Thomas, Ont.	Alma College	P. S. Dobson
Saskatoon, Sask.	University of Saskatchewan	James S. Thomson
Stanstead, Que.	Stanstead Wesleyan College	E. C. Anaron
Toronto, Ont.	University of Toronto	H. J. Cody
Toronto, Ont.	Upper Canada College	T. W. L. MacDermont
Toronto, Ont.	Victoria University	E. W. Wallace
Truro, N. S.	Nova Scotia Agricultural College	Lyman T. Chapman
Vancouver, B. C.	University of British Columbia	Leonard S. Klinck
Winnipeg, Man.	University of Manitoba	Sidney E. Smith
Winnipeg, Man.	Wesley College	John H. Riddell
Wolfville, N. S.	Acadia University	F. W. Patterson

SECTION XIV
PRESIDENTS OF JUNIOR COLLEGES

City	Institution	President
Alabama		
Marion	Marion Institute	Walter I. Murfee
St. Bernard	St. Bernard College	Ambrose Reger
Arizona		
Phoenix	Phoenix Junior College	E. W. Montgomery
Thatcher	Gila Junior College	E. Edgar Fuller
Arkansas		
Conway	Central College	J. S. Rogers
El Dorado	El Dorado Junior College	J. I. McClurkin
Fort Smith	Fort Smith Junior College	J. W. Ramsey
Little Rock	Little Rock Junior College	E. Q. Brothers
Magnolia	Agricultural & Mechanical College	C. A. Overstreet
Russellville	Arkansas Polytechnic College	J. W. Hull
California		
Arlington	Southern California Junior College	E. E. Cossentine
Auburn	Placer Junior College	John H. Napier, Jr.
Azusa	Citrus Junior College	F. S. Hayden
Bakersfield	Bakersfield Junior College	Grace V. Bird, Dean
Belmont	College of Notre Dame	Sister Helen Bernardine
Berkeley	Armstrong College	J. Evan Armstrong
Berkeley	Williams Junior College	J. D. Hopkins
Brawley	Brawley Junior College	Percy E. Palmer
Coalinga	Coalinga Extension Center	T. A. Ellestad
Compton	Compton Junior College	O. Scott Thompson
El Centro	Central Junior College	Guy A. Weakley
Fullerton	Fullerton Junior College	Louis E. Plummer
Glendale	Glendale Junior College	Charles A. Nelson
Hollister	San Benito County Junior College	James P. Davis
Kentfield	Marin Junior College	A. C. Olney
Lancaster	Antelope Valley Junior College	D. J. Roach
Long Beach	Long Beach Junior College	John L. Lounsbury
Los Angeles	Cumnock Junior College	R. C. Brooks
Los Angeles	Holmby College	Frederica de Laguna
Los Angeles	Los Angeles City College	Rosco C. Ingalls
Los Angeles	Los Angeles Pacific College	Byron S. Lamson
Los Angeles	Marymount Junior College	Mother Ignatius
Marysville	Yuba Junior College	Pedro Osuna
Menlo Park	Menlo Junior College	Lowry S. Howard
Modesto	Modesto Junior College	D. C. Baker
Oceanside	Oceanside-Carlsbad Junior College	Ralph I. Hale
Ontario	Chaffey Junior College	Gardiner W. Spring
Pasadena	Pasadena Junior College	John W. Harbeson
Pomona	Pomona Junior College	J. E. Walker
Porterville	Porterville Junior College	B. H. Grisemer
Reedley	Reedley Junior College	J. O. McLaughlin
Riverside	Riverside Junior College	A. G. Paul
Sacramento	Sacramento Junior College	J. B. Lillard
Salinas	Salinas Junior College	Richard J. Werner
San Bernardino	San Bernardino Valley Union Junior College	Nicholas Ricciardi
San Diego	San Diego Junior College	Walter R. Hepner
San Francisco	California School of Mechanical Arts	George A. Merrill
San Francisco	Cogswell Polytechnical College	George B. Miller
San Francisco	San Francisco Junior College	A. J. Cloud
San Luis Obispo	San Luis Obispo Junior College	Henry A. Cross, Dean
San Mateo	San Mateo Junior College	Charles S. Morris
Santa Ana	Santa Ana Junior College	D. K. Hammond
Santa Maria	Santa Maria Junior College	Andrew P. Hill
Santa Monica	Santa Monica Junior College	Ralph H. Bush
Santa Rosa	Santa Rosa Junior College	Floyd P. Bailey
Stockton	Stockton Junior College	Dwayne Orton
Susanville	Lassen Junior College	N. H. McCollom
Taft	Taft Junior College	John G. Howes
Ventura	Ventura Junior College	D. R. Henry
Visalia	Visalia Junior College	L. J. Williams

City	Institution	President
Colorado		
Denver	Colorado Woman's College	J. E. Huchingson
Grand Junction	Mesa College	Horace J. Wubben
Pueblo	Pueblo Junior College	L. R. Wren
Trinidad	Trinidad State Junior College	William R. Ross
Connecticut		
Bridgeport	Junior College of Connecticut	E. Everett Cortright
New Haven	Larson Junior College	George V. Larson
Thompson	Marianapolis College	John C. Navickas
Thompson	Marot Junior College	Mary L. Marot
District of Columbia		
Washington	Arlington Hall Junior College	Carrie Sutherlin
Washington	Chevy Chase Junior College	Philip M. Beil
Washington	Dunbarton College of Holy Cross	Sister Rose Elizabeth
Washington	Marjorie Webster Schools, Inc.	Marjorie Webster
Washington	Mount Vernon Seminary	George W. Lloyd
Florida		
St. Petersburg	St. Petersburg Junior College	Robert B. Reed
Sarasota	Ringling Junior College	Verman Kimbrough
West Palm Beach	Palm Beach Junior College	John I. Leonard
Georgia		
Americus	Georgia Southwestern College	Peyton Jacob
Augusta	Junior College of Augusta	Eric W. Hardy
Barnesville	Gordon Military College	J. E. Guillebeau
Carrollton	West Georgia College	I. S. Ingram
Cochran	Middle Georgia College	L. H. Browning
Cuthbert	Andrew College	S. C. Olliff
Dahlonega	North Georgia College	Jonathan C. Rogers
Douglas	South Georgia College	J. M. Thrash
Milledgeville	Georgia Military College	J. H. Jenkins
Mount Vernon	Brewton-Parker Institute	A. M. Gates
Norman Park	Norman Junior College	Paul Carroll
Savannah	Armstrong Junior College	Ernest A. Lowe
Tifton	Abraham Baldwin Agricultural College	G. H. King
Waleska	Reinhardt College	W. M. Bratton
Young Harris	Young Harris College	T. Jack Lance
Idaho		
Boise	Boise Junior College	Eugene B. Chaffee
Coeur d'Alene	Coeur d'Alene Junior College	Orrin E. Lee
Pocatello	University of Idaho, Southern Branch	J. R. Nichols, Exec. Dean
Rexburg	Ricks College	Hyrum Manwaring
Illinois		
Carlinville	Blackburn College	William M. Hudson
Chicago	Chicago Christian College	Frederick H. Wezeman
Chicago	Herzl Junior College	Dorph Brown, Dean
Chicago	Morgan Park Junior College	Albert G. Dodd, Dean
Chicago	North Park College	Algoth Ohlson
Chicago	Woodrow Wilson Junior College	John A. Bartky, Dean
Chicago	Wright Junior College	W. H. Conley, Dean
Cicero	Morton Junior College	J. R. McDonald, Acting Supt.
Evanston	Evanston Collegiate Institute	T. Otmann Firing
Godfrey	Monticello College	George I. Rohrbough
Harvey	Thornton Junior College	James L. Beck
Joliet	Joliet Junior College	W. W. Haggard
La Grange	Lyons Township Junior College	Ross Holt
La Salle	La Salle-Peru-Oglesby Junior College	Frank A. Jensen

City	Institution	President
Lincoln	Lincoln College	Wm. D. Copeland
Mt. Carroll	Frances Shimer Junior College and Prepartory School	A. Beth Hostetter
Quincy	Quincy College	John Koebele
Springfield	Springfield Junior College	Walter L. Wilkins
Wilmette	Mallinkrodt College	Mother Sebastian

Indiana

Collegeville	St. Joseph's College	Aloys H. Dirksen
Fort Wayne	Concordia College	Ottomar Krueger
Gary	Gary Junior College	Albert Fertsch
Kokomo	Kokomo Junior College	H. A. Drake
Vincennes	Vincennes University	Walter A. Davis

Iowa

Albia	Albia Junior College	John S. Chambers, Dean
Bloomfield	Bloomfield Junior College	E. T. Carlstedt
Boone	Boone Junior College	J. R. Thorngren, Dean
Britt	Britt Junior College	L. J. Thies
Burlington	Burlington Junior College	Robert I. White
Cedar Rapids	Mount Mercy Junior College	Sister Mary Xavier
Centerville	Centerville Junior College	E. W. Fannon, Supt.
Chariton	Chariton Junior College	F. A. Lunan, Dean
Cherokee	Cherokee Junior College	Sister Mary Emmanuel
Clarinda	Clarinda Junior College	Herbert L. Glynn
Clinton	Mount St. Clare Junior College	Mother M. Paul Carrico
Creston	Creston Junior College	V. I. Sanders, Dean
Des Moines	Dowling College	J. J. Boylan
Des Moines	Grand View College	Alfred C. Nielsen
Eagle Grove	Eagle Grove Junior College	Gerald Shepherd, Dean
Elkader	Elkader Junior College	D. L. Wood
Emmetsburg	Emmetsburg Junior College	J. A. Greenlee, Dean
Estherville	Estherville Junior College	N. E. Demoney
Forest City	Waldorf College	J. L. Rendahl
Fort Dodge	Fort Dodge Junior College	Harris Dickey, Dean
Hopkinton	Lennox College	David S. de Best, Ass't
Independence	Independence Junior College	F. E. Mueller, Dean
Iowa Falls	Ellsworth Junior College	Sheridan R. Jones, Dean
Lamoni	Graceland College	G. N. Briggs
Marshalltown	Marshalltown Junior College	B. R. Miller
Maquoketa	Maquoketa Junior College	E. L. Miller, Dean
Mason City	Mason City Junior College	James Rae
Muscatine	Muscatine Junior College	Willetta Strahan, Dean
Orange City	Northwestern Junior College	Jacob Heemstra
Osceola	Osceola Junior College	Lillian V. Hjort, Dean
Ottumwa	Ottumwa Heights College	Sister Hazel Roth
Red Oak	Red Oak Junior College	J. R. Inman
Sheldon	Sheldon Junior College	W. C. Jackman
Tipton	Tipton Junior College	Ralph E. Bente
Washington	Washington Junior College	Harland W. Mead
Waukon	Waukon Junior College	B. K. Orr
Webster City	Webster City Junior College	W. D. Wesselink, Dean

Kansas

Arkansas City	Arkansas City Junior College	C. E. St. John
Chanute	Chanute Junior College	W. W. Bass, Dean
Coffeyville	Coffeyville Junior College	W. M. Ostenberg, Dean
Dodge City	Dodge City Junior College	R. C. Hunt, Dean
El Dorado	El Dorado Junior College	Earl Walker, Dean
Fort Scott	Fort Scott Junior College	W. S. Davison, Dean
Garden City	Garden City Junior College	Ira O. Scott
Haviland	Friends Bible College	Charles A. Beals
Hays	St. Joseph's College and Military Academy	Alfred Carney
Hesston	Hesston College & Bible School	Milo Kauffman
Highland	Highland Junior College	C. M. Rankin
Hillsboro	Tabor College	Abraham E. Janzen
Hutchinson	Hutchinson Junior College	C. M. Lockman, Dean
Independence	Independence Junior College	E. R. Stevens, Dean
Iola	Iola Junior College	R. H. Carpenter
Kansas City	Kansas City Junior College	J. F. Wellemeyer
McPherson	Central Academy & College	Charles A. Stoll
Paola	College of Paola and Ursuline Academy	Mother Jerome Schaub
Parsons	Parsons Junior College	E. F. Farner, Dean
Wichita	Sacred Heart Junior College	Leon A. McNeill
Winfield	St. John's College	Carl S. Mundinger

Kentucky

Campbellsville	Campbellsville College	D. J. Wright
Columbia	Lindsey Wilson Junior College	A. P. White
Covington	Villa Madonna College	M. Leick
Hopkinsville	Bethel Woman's College	J. W. Gaines
Jackson	Lees Junior College	J. O. Van Meter
London	Sue Bennett College	K. C. East
Louisville	Sacred Heart College	Sister M. Dominica, Dean
Maple Mount	Mount St. Joseph Junior College	Mother M. Thompson
Nazareth	Nazareth Junior College and Academy	Sister Margaret Gertrude, Dean
Paducah	Paducah Junior College	R. G. Matheson, Jr.,
Pikeville	Pikeville College	Harry M. Crooks
Pippapass	Caney Junior College	Charles H. Houghton
St. Catherine	St. Catherine Junior College	Sister Bonaventure
St. Mary	St. Mary's College	Francis J. Jaglowicz
Williamsburg	Cumberland College	James L. Creech

Louisiana

Grand Coteau	Normal College of Sacred Heart	Mother Fitzwilliam
Hammond	Southeastern Louisiana College	J. Leon Clark
Lafayette	De La Salle Normal School	Brother N. John
Monroe	Northeast Center, L. S. U.	C. C. Colvert, Dean
Shreveport	Dodd College	E. C. Solomon
Shreveport	St. Vincent's College	Sister Mary Stanislaus, Dean

Maine

Portland	Westbrook Junior College	Milton D. Proctor
Springvale	Nasson College	Dawn N. Wallace

Maryland

Catonsville	St. Charles College	E. T. Harrigan
Forest Glen	National Park College	Roy T. Davis
St. Mary's City	St. Mary's Female Seminary—Junior College	M. Adele France

Massachusetts

Auburndale	Lasell Junior College	Guy M. Winslow
Bradford	Bradford Junior College	Katharine M. Denworth
Cambridge	Cambridge School of Liberal Arts	I. T. Richards, Director
Dudley	Nichols Junior College	James L. Conrad
Newton	Mt. Ida School and Junior College	C. A. Fenner
Wellesley	Pine Manor Junior College	Marie W. Potter

Michigan

Bay City	Bay City Junior College	George E. Butterfield Dean
Flint	Flint Junior College	W. S. Shattuck, Dean
Grand Rapids	Catholic Junior College	A. F. Bukowski
Grand Rapids	Grand Rapids Junior College	Arthur Andrews
Highland Park	Highland Park Junior College	George I. Altenburg, Dean
Ironwood	Gogebic Junior College	R. Ernest Dear, Dean
Jackson	Jackson Junior College	H. A. Steele
Muskegon	Muskegon Junior College	A. G. Umbreit
Port Huron	Port Huron Junior College	John H. McKenzie
Spring Arbor	Spring Arbor Seminary & Junior College	LeRoy M. Lowell

Minnesota

Coleraine	Itasca Junior College	Joseph B. Davis, Dean
Duluth	Duluth Junior College	R. D. Chadwick, Dean
Ely	Ely Junior College	S. F. Olson
Eveleth	Eveleth Junior College	C. H. Gibson
Hibbing	Hibbing Junior College	H. A. Drescher
Rochester	Rochester Junior College	R. W. Goddard
St. Paul	Concordia College	Martin Graebner
Virginia	Virginia Junior College	Floyd B. Moe, Dean

Mississippi

Clinton	Hillman College	M. P. L. Berry
Decatur	East Central Junior College	L. O. Todd
Ellisville	Jones County Junior College	M. P. Bush
Goodman	Holmes Junior College	M. C. McDaniel
Gulfport	Gulf Park College	Richard G. Cox
Holly Springs	Mississippi Synodical College	R. F. Cooper
Mathiston	Wood Junior College	Jasper Weber
Moorhead	Sunflower Junior College	Paul M. West
Newton	Clarke Memorial College	W. L. McMullan
Perkinston	Harrison-Stone-Jackson Junior College	C. J. Darby
Poplarville	Pearl River Junior College	R. E. L. Sutherland
Raymond	Hinds Junior College	G. M. McLendon
Scooba	East Mississippi Junior College	J. D. Wallace

City	Institution	President
Senatobia	Northwest Mississippi Junior College	R. C. Pugh
Summit	Southwest Mississippi Junior College	J. M. Kenna
Vicksburg	All Saints' Episcopal College	W. G. Christien
Wesson	Copiah Lincoln Junior College	James M. Ewing

Missouri

Bolivar	Southwest Baptist College	Courts Redford
Columbia	Christian College	J. C. Miller
Columbia	Stephens College	James M. Wood
Conception	Conception Junior College	Edward E. Malone
Concordia	St. Paul's College	Albert J. C. Moeller
Flat River	Junior College of Flat River	Irvin F. Coyle, Dean
Fulton	William Woods College	H. G. Harmon
Hannibal	Hannibal-LaGrange Junior College	Andrew F. Morris
Iberia	Iberia Junior College	G. Byron Smith
Jefferson City	Jefferson City Junior College	G. J. Linker
Kansas City	Kansas City Junior College	Edward M. Bainter
Kansas City	St. Teresa's Junior College	Sister Marcella
Moberly	Moberly Junior College	M. A. Spohrer, Dean
Monett	Monett Junior College	H. D. McEachen
Nevada	Cottey Junior College for Women	Marjorie Mitchell
St. Joseph	St. Joseph Junior College	Nelle Blum, Dean
Trenton	Trenton Junior College	S. M. Rissler
Warrenton	Central Wesleyan College	Franklin F. Lewis

Montana

Great Falls	Great Falls Junior College	J. A. Rooney
Havre	Northern Montana College	G. H. Vande Bogart

Nebraska

Hebron	Hebron College and Academy	K. F. Weltner
McCook	McCook Junior College	J. R. Johnson
Scottsbluff	Scottsbluff Junior College	M. L. Coleman
Wahoo	Luther College	Paul M. Lindberg

New Hampshire

New London	Colby Junior College	H. Leslie Sawyer
Rye Beach	Stoneleigh College	Richard D. Currier

New Jersey

Hackettstown	Centenary Junior College	Robert J. Trevorrow
Long Branch	Monmouth Junior College	Edward G. Schlaefer, Dean
Morristown	Morris Junior College	Arthur S. Platt
Newark	Essex Junior College	A. M. Koch
Paterson	College of Paterson	Herbert S. Robinson
Perth Amboy	Middlesex Junior College	Ladd Lukats, Dean
Roselle	Union County Junior College	Charles G. Cole, Dean
Teaneck	Bergen Junior College	C. L. Littel

New Mexico

Portales	Eastern New Mexico Junior College	Donald W. Mac Kay

New York

Briarcliff Manor	Briarcliff Junior College	Doris L. Flick
Cazenovia	Cazenovia Seminary	H. W. Hebblethwaite
Bronxville	Concordia Collegiate Institute	Arthur J. Doege
New York	Finch Junior College	Jessica G. Cosgrave
North Chili	A. M. Chesbrough Seminary	Merlin G. Smith

North Carolina

Asheville	Biltmore College	C. A. Lloyd, Dean
Banner Elk	Lees-McRae College	Edgar H. Tufts
Belmont	Belmont Abbey Junior College	Cuthbert Allen, Rector
Boiling Springs	Boiling Springs College	George J. Burnett
Brevard	Brevard College	Eugene J. Coltrane
Buies Creek	Campbell College	L. H. Campbell
Louisburg	Louisburg College	D. E. Earnhardt
Mars Hill	Mars Hill College	Hoyt Blackwell
Maxton	Presbyterian Junior College for Men	Louis C. La Motte
Misenheimer	Pfeiffer Junior College	W. S. Sharp
Montreat	Montreat College	R. C. Anderson
Murfreesboro	Chowan Junior College	J. L. Carrick
Raleigh	Peace Junior College	William C. Pressly
Raleigh	St. Mary's School & Junior College	Mrs. Ernest Cruikshank
Salemburg	Pineland College and Edwards Military Institute	W. J. Jones
Sedalia	Palmer Memorial Institute	C. Hawkins Brown
Statesville	Mitchell College	Mrs. W. B. Ramsay
Wingate	Wingate Junior College	C. C. Burris

North Dakota

Bottineau	North Dakota School of Forestry	A. F. Arnason
Wahpeton	North Dakota State School of Science	E. F. Riley

Ohio

Rio Grande	Rio Grande College	William A. Lewis
Urbana	Urbana Junior College	Russell Eaton
Van Wert	Giffin College	C. G. Giffin

Oklahoma

Altus	Altus Junior College	Emily B. Smith
Bacone	Bacone Junior College	B. D. Weeks
Bartlesville	Bartlesville Junior College	Paul C. Norvell
Bristow	Bristow Junior College	E. H. Black
Claremore	Oklahoma Military Academy	Walter E. Downs
Durant	Oklahoma Presbyterian College	Andrew Bramlett
Hobart	Kiowa County Junior College	B. A. McElyea
Lawton	Cameron State Agricultural College	Charles M. Conwill
Miami	Northeastern Oklahoma Junior College	E. L. Smith
Muskogee	Muskogee Junior College	Bessie M. Huff, Dean
Oklahoma City	Capitol Hill Junior College	A. H. Parmelee
Okmulgee	Okmulgee Junior College	W. A. Rutledge
Sapulpa	Sapulpa Junior College	E. O. Shaw
Seminole	Seminole Junior College	John G. Mitchell
Tishomingo	Murray State School of Agriculture	Clive E. Murray
Tonkawa	University Preparatory School & Junior College	R. R. Robinson
Tulsa	Monte Cassino Junior College	Sister M. Alexia Connors
Warner	Connors State Agricultural College	Jacob Johnson
Wetumka	Wetumka Junior College	G. S. Sanders
Wilburton	Eastern Oklahoma College	C. C. Dunlap
Woodward	Woodward Junior College	R. R. Russell

Oregon

Portland	Albany College at Portland	Thomas W. Bibb
Portland	Multnomah College	Edward L. Clark

Pennsylvania

Bryn Mawr	Harcum Junior College	Edith H. Harcum
Cambridge Springs	Alliance College	John J. Kolasa
Chambersburg	Penn Hall Junior College & Preparatory School	Frank S. Magill
La Plume	Scranton-Keystone Junior College	Byron S. Hollinshead
Swarthmore	Wildcliff Junior College	H. M. Crist
Wyomissing	Wyomissing Polytechnic Institute	Arthur C. Harper

South Carolina

Anderson	Anderson College	Annie D. Denmark
Central	Wesleyan Methodist College	John F. Childs
Seneca	Seneca Junior College	J. D. Bryan
Spartanburg	Textile Institute	R. B. Burgess

South Dakota

Freeman	Freeman Junior College	John D. Unruh
Mitchell	Notre Dame Junior College	J. M. Brady
Wessington Springs	Wessington Springs Junior College	W. A. Harden
Yankton	Mt. Marty Junior College	Mother M. Jerome

Tennessee

Athens	Tennessee Wesleyan College	James L. Robb
Henderson	Freed-Hardeman College	N. B. Hardeman

City	Institution	President
Madisonville	Hiwassee College	T. A. Frick
Nashville	David Lipscomb College	E. H. Ijams
Nashville	Trevecca Nazarene College	A. B. Mackey
Nashville	Ward-Belmont School	A. B. Benedict
Pulaski	Martin College	Keener L. Rudolph
Rogersville	Swift Memorial Junior College	W. C. Hargrave

Texas

Amarillo	Amarillo College	J. F. Mead
Arlington	North Texas Agricultural College	E. E. Davis, Dean
Beaumont	Lamar College	C. W. Bingman
Brenham	Blinn College	Charles F. Schmidt
Brownsville	Brownsville Junior College	E. C. Dodd
Cisco	Randolph Junior College	J. T. McKissick
Clarendon	Clarendon Junior College	H. T. Burton
Clifton	Clifton Junior College	C. Tyssen, Acting
Corpus Christi	Corpus Christi Junior College	R. B. Fisher
Decatur	Decatur Baptist College	J. L. Ward
Edinburg	Edinburg Junior College	R. P. Ward
Fort Worth	Our Lady of Victory College	Sister M. Albertine
Gainesville	Gainesville Junior College	H. O. McCain
Goose Creek	Lee Junior College	Harmon Lowman
Greenville	Wesley College	George B. Jackson
Hillsboro	Hillsboro Junior College	L. W. Hartsfield
Houston	University of Houston	N. K. Dupre, Dean
Jacksonville	Jacksonville College	J. W. Overall
Jacksonville	Lon Morris College	C. E. Peeples
Keene	Southwestern Junior College	H. H. Hamilton
Kerrville	Schreiner Institute	J. J. Delaney
Kilgore	Kilgore College	B. E. Masters, Dean
Marshall	College of Marshall	F. S. Groner
Paris	Paris Junior College	J. R. McLemore
Plainview	Wayland Junior College	G. W. McDonald
Ranger	Ranger Junior College	William T. Walton
San Angelo	San Angelo College	Wilson H. Elkins
San Antonio	San Antonio Junior College	J. E. Nelson, Director
Seguin	Texas Lutheran College	Wm. F. Kraushaar
Stephenville	John Tarleton Agricultural College	J. Thomas Davis, Dean
Tehuacana	Westminster College	Clarence A. Sutton
Temple	Temple Junior College	L. C. Procter
Terrell	Texas Military College	Mrs. Louis C. Perry
Texarkana	Texarkana Junior College	H. W. Stilwell
Tyler	Tyler Junior College	J. M. Hodges
Victoria	Victoria Junior College	P. S. Garner
Weatherford	Weatherford College	G. C. Boswell
Wichita Falls	Hardin Junior College	H. D. Fillers

Utah

Ephraim	Snow College	James A. Nuttall
Ogden	Weber College	H. A. Dixon
St. George	Dixie Junior College	Glenn E. Snow
Salt Lake City	Westminster College	H. W. Reherd

Vermont

Montpelier	Vermont Junior College	John N. Kingsley
Poultney	Green Mountain Junior College	Jesse P. Bogue

Virginia

Blackstone	Blackstone College for Girls	J. Paul Glick
Bluefield	Bluefield College	Edwin C. Wade
Bristol	Sullins College	W. E. Martin
Bristol	Virginia Intermont College	H. G. Noffsinger
Buena Vista	Southern Seminary & Junior College	Robert Lee Durham
Danville	Averett College	Curtis Bishop
Danville	Stratford College	John C. Simpson
Dayton	Shenandoah College	Wade S. Miller
Ferrum	Ferrum Junior College	J. A. Chapman
Harrisonburg	Eastern Mennonite School	John L. Stauffer
Marion	Marion College	Hugh Rhyne
Petersburg	Southern College	Arthur K. Davis

Washington

Aberdeen	Grays Harbor Junior College	Lewis C. Tidball
Centralia	Centralia Junior College	Margaret Corbet
Lacey	St. Martin's College	Lambert Burton
Longview	Lower Columbia Junior College	David L. Soltau
Mount Vernon	Mount Vernon Junior College	Charles H. Lewis
Parkland	Pacific Lutheran College	O. A. Tingelstad
Spokane	Spokane Junior College	G. H. Schlauch
Yakima	Yakima Valley Junior College	Elizabeth A. Prior

West Virginia

Beckley	Beckley College	J. L. Baumgardner
Charleston	Kanawha College	L. S. McDaniel
Keyser	Potomac State School	E. E. Church
Lewisburg	Greenbrier College	F. W. Thompson

Wisconsin

Madison	Edgewood Junior College of the Sacred Heart	Sister Marie Aileen
Milwaukee	Concordia College	L. C. Rincker
Mt. Calvary	St. Lawrence Junior College	Alexis Gore
St. Nazianz	Salvatorian Seminary	Edwin Buers

Canal Zone

Balboa	Canal Zone Junior College	Fred Hosler, Dean

Canada

Calgary, Alta.	Mount Royal Junior College	George W. Kerby

SECTION XV
HEADS OF PRIVATE SCHOOLS

City	Institution	Head
Alabama		
Fairhope	School of Organic Education	Marietta Johnson
Mobile	University Military School	William S. Pape
Thorsby	Thorsby Institute	Helen C. Jenkins
California		
Berkeley	Anna Head School	I. R. Hyde
Beverly Hills	Berkeley Hall School	Mary E. Stevens
Claremont	Webb School of California	Thompson Webb
Culver City	Pacific Military Academy	McCall Aldrich
La Jolla	The Bishop's School	Caroline S. Cummins
Los Angeles	Cumnock School	Raymond C. Brooks
Los Angeles	Marlborough School for Girls	Ada S. Blake
Los Angeles	Urban Academy, Inc.	P. G. McDonnell
Los Angeles	Westlake School for Girls	Frederica de Laguna
Los Gatos	Montezuma School for Boys	Howard R. Porter
Menlo Park	Menlo School and Junior College	Lowry S. Howard
North Hollywood	Harvard School	Robert B. Gooden
Pacific Beach	Brown Military Academy	Charles Bain
Palo Alto	Castilleja School	Mary I. Lockey
Palo Alto	Miss Harker's School for Girls	Catherine Harker
Pasadena	Westridge School for Girls	Anne F. Parker
San Francisco	Miss Burke's School	Barbara Burke
San Francisco	Drew School	John S. Drew
San Francisco	Sarah Dix Hamlin School	Mrs. E. B. Stanwood
San Rafael	San Rafael Military Academy	A. L. Stewart
San Rafael	The Tamalpais School	F. J. Daly
Colorado		
Colorado Springs	Fountain Valley School	Francis Mitchell Froelicher
Denver	Kent School for Girls	Mary A. Bogue
Connecticut		
Avon	Avon Old Farms	Percy G. Kammerer
Bloomfield	St. Thomas Seminary	Henry O'Brien
Cheshire	Cheshire Academy	Arthur N. Sheriff
Clinton	Morgan School	George L. Scott
Farmington	Miss Porter's School	Robert Porter Keep
Greenwich	Brunswick School	William L. Henry
Greenwich	The Edgewood School	Euphrosyne Langley
Greenwich	Greenwich Academy	Ruth West Campbell
Greenwich	Rosemary Hall	Constance Evers and Eugenia Jessup
Hartford	Oxford School	Mrs. Vachel Lindsay
Kent	Kent School	Frederick H. Sill
Lakeville	Hotchkiss School	George Van Santvoord
Middlebury	Westover School	Louise B. Dillingham
Milford	The Milford School	S. B. Rosenbaum
New Haven	Collegiate School	Arthur Pite
New Haven	The Day School	Julia B. Thomas
New Haven	Hamden Hall Country Day School	E. Stanley Taylor
New Haven	Hopkins Grammar School	George B. Lovell
New London	Bulkeley School	Homer K. Underwood
New Milford	Canterbury School	Nelson Hume
Norwalk	Hillside School and Junior College	Gretchen Battey
Norwich	Norwich Free Academy	Henry A. Tirrell
Pomfret	Pomfret School	Halleck Lefferts
Rowayton	The Thomas School	Mabel Thomas
Salisbury	Salisbury School	Emerson B. Quaile
Simsbury	Ethel Walker School	Mrs. Elliott Speer
Simsbury	Westminster School	Arthur Milliken
South Kent	South Kent School	Samuel S. Bartlett
Stamford	The King School	V. A. Dwelle
Stamford	Low-Heywood School	Mary R. Roper
Suffield	Suffield Academy	Brownell Gage
Wallingford	The Choate School	George C. St. John
Washington	The Gunnery School	Tertius van Dyke
Washington	Wykeham Rise School, Inc.	Fanny E. Davies
Waterbury	St. Margaret's School	Alberta C. Edell
Watertown	The Taft School	Paul F. Cruikshank
West Hartford	Kingswood School	G. R. H. Nicholson
Windsor	The Loomis School	N. H. Batchelder
Winsted	The Gilbert School	Henry S. Moseley
Delaware		
Middletown	St. Andrew's School	Walden Pell 2nd
Wilmington	Friends School	Wilmot R. Jones
Wilmington	Tower Hill School	Burton P. Fowler
District of Columbia		
Washington	Academy of the Holy Cross	Sister M. Rose Elizabeth
Washington	Devitt School	J. F. Byerly
Washington	Emerson Institute	Theodore D. Gatchel
Washington	Fairmont School & Junior College	Maud van Woy
Washington	Georgetown Visitation Convent	Sister M. Sheerin
Washington	Gunston Hall	Mary L. Gildersleeve
Washington	Holton-Arms School & Junior College	Jessie M. Holton
Washington	Immaculata Seminary	Sister Mary Genevieve
Washington	Mt. Vernon Seminary	George W. Lloyd
Washington	National Cathedral School	Mabel B. Turner
Washington	St. Albans	Albert H. Lucas
Washington	Sidwell Friends School	Albert E. Rogers
Florida		
Jacksonville	The Bolles School	Roger M. Painter
Miami	The Cate School	W. B. Cate
Miami	Miss Harris' School	Julia F. Harris
Miami Beach	Coburn Country Day School	Nelson Coburn
Orlando	Cathedral School for Girls	John D. Wing
Palm Beach	Palm Beach Private School	Karl B. Dearborn
St. Leo	St. Leo College Prep School	Ernest Schultz
St. Petersburg	Aikin Open Air School	Mrs. Maude Aikin
St. Petersburg	Florida Military Academy	W. B. Mendels
Georgia		
Atlanta	North Avenue Presbyterian School	Thyrza S. Askew
Atlanta	Peacock School for Boys	J. H. Peacock
Atlanta	University School for Boys	W. E. Dendy
Atlanta	Washington Seminary	Llewellyn D. Scott
College Park	Georgia Military Academy	J. C. Woodward
Gainesville	Riverside Military Academy	Sandy Beaver
Oxford	Emory at Oxford	George S. Roach
Rome	Darlington School	C. R. Wilcox
Savannah	Pape School	Nina A. Pape
Illinois		
Aledo	Roosevelt Military Academy	Karl J. Stouffer
Alton	Western Military Academy	C. L. Persing
Chicago	Chicago Latin School	James O. Wood
Chicago	Faulkner School for Girls	Elizabeth Faulkner
Chicago	The Girls Latin School of Chicago	Elizabeth Singleton
Chicago	Harvard School for Boys	Charles E. Pence
Chicago	Loring School	Cecilia Russell
Chicago	Luther Institute	John C. Anderson
Chicago	Francis W. Parker School	Herbert W. Smith
Chicago	Starrett School for Girls	Gerard T. Smith
Chicago	Stickney School	Stanley M. Durrant
Chicago	University High School	P. B. Jacobson
Elgin	Elgin Academy	Earl G. Leinbach
Evanston	Marywood School for Girls	Sister St. Philomene
Evanston	Roycemore School	Rebecca S. Ashley
La Grange	Broadview Academy	A. J. Olson
Lake Forest	Ferry Hall	Eloise R. Tremain
Lake Forest	Lake Forest Academy	John W. Richards

City	Institution	Head
Morgan Park	Morgan Park Military Academy	Harry D. Abells
Mooseheart	Mooseheart School	W. J. Leinweber
Onarga	Onarga Military School	J. E. Bittinger, Supt.
Rock Island	Villa De Chantal	Sister Marie
Winnetka	The North Shore Country Day School	Perry D. Smith

Indiana

Culver	Culver Military Academy	L. R. Gignilliat
Howe	Howe School	Burrett B. Bouton
Indianapolis	Tudor Hall School for Girls, Inc.	I. Hilda Stewart

Iowa

Dubuque	Columbia Academy	Michael J. Martin

Kansas

Salina	St. John's Military School	R. L. Clem, Supt.

Kentucky

Lexington	Sayre School for Girls	J. C Hanley
Louisville	Kentucky Home School for Girls	Annie S. Anderson
Louisville	Louisville Collegiate School	Marjorie Hiscox
Lyndon	Kentucky Military Institute	Charles B. Richmond
Millersburg	Millersburg Military Institute	W. R. Nelson
Shelbyville	Science Hill School	Juliet J. Poynter

Louisiana

New Orleans	Gilbert Academy	Margaret Davis Bowen
New Orleans	Louise S. McGehee School	Nina P. Davis
New Orleans	Metairie Park Country Day School	Ralph E. Boothby
New Orleans	Isidore Newman School	C. C. Henson

Maine

Bethel	Gould Academy	Philip S. Sayles
Charleston	Higgins Classical Institute	Wm. A. Tracy
Dover-Foxcroft	Foxcroft Academy	Frank G. Stone
Fryeburg	Fryeburg Academy	Elroy O. LaCasce
Hebron	Hebron Academy	Ralph L. Hunt
Houlton	Ricker Classical Institute & Junior College	R. M. Hayes
Kents Hill	Kents Hill School	Edward W. Hincks
North Bridgton	Bridgton Academy	H. H. Sampson
Pittsfield	Maine Central Institute	Edwin M. Purinton
Portland	The Waynflete School	Barbara B. Woodruff
Saco	Thornton Academy	Hollis A. Sanderson
South Berwick	Berwick Academy	Ercell M. Gordon
Vassalboro	Oak Grove School for Girls	Robert E. Owen
Waterville	Coburn Classical Institute	Hugh A. Smith

Maryland

Baltimore	Boys' Latin School	Frederick A. Hahn
Baltimore	The Bryn Mawr School	Katherine Van Bibber
Baltimore	Friends School	Edwin C. Zavitz
Baltimore	Gilman Country School	E. Boyd Morrow
Baltimore	Latin School for Girls	Lillian M. Kloppel
Baltimore	Mount St. Agnes School	Sister Mary Kathleen
Baltimore	Mt. St. Joseph College High School	Brother Edmund
Baltimore	Notre Dame Preparatory School	Sister M. Ethelbert
Baltimore	The Park School	Hans Froelicher, Jr.
Baltimore	Roland Park Country School	Elizabeth M. Castle
Catonsville	St. Timothy's School	Ella R. Watkins
Charlotte Hall	Charlotte Hall School	M. D. Burgee
Forest Glen	National Park College	Roy Tasco Davis
Garrett Park	Georgetown Preparatory School	Robert P. Arthur
Garrison	Garrison Forest School	Jean G. Marshall
Glencoe	Oldfields School, Inc.	Duncan McCulloch
McDonogh	McDonogh School	Louis E. Lamborn
Port Deposit	The Tome School	Charles J. Keppel
Reisterstown	The Hannah More Academy	Laura Fowler
Ruxton	Greenwood School	Mary A. Elcock
St. James	St. James School	Adrian H. Onderdonk
Severna Park	Severn School	Rolland M. Teel
Towson	Loyola High School	John J. Long

Massachusetts

Andover	Abbot Academy	Marguerite Hearsey
Andover	Phillips Academy	Claude Moore Fuess
Ashburnham	Cushing Academy	Clarence P. Quimby
Belmont	Belmont Hill School	Thomas R. Morse
Boston	Boston Academy of Notre Dame	Sister Frances
Boston	The Brimmer School	Mabel Cummings
Boston	Chauncy Hall School	Franklin T. Kurt
Boston	Erskine School	Euphemia E. McClintock
Boston	Huntington School for Boys	Charles H. Sampson
Boston	The May School	Mrs. Chas. H. Haskins
Boston	The Winsor School	Katharine Lord
Brookline	Choate School	Augusta Choate
Brookline	The Rivers School	Clarence E. Allen
Cambridge	The Browne & Nichols School	Geoffrey W. Lewis
Cambridge	The Buckingham School	Marian W. Vaillant
Cambridge	Manter Hall School	J. C. Hall
Cambridge	New Preparatory School	Ernest Benshimol
Chestnut Hill	The Beaver Country Day School	Eugene R. Smith
Concord	Concord Academy	Valeria A. Knapp
Concord	Middlesex School	Lawrence Terry
Danvers	St. John's Preparatory School	Brother Aubert
Dedham	Noble & Greenough School	Charles Wiggins
Deerfield	Deerfield Academy	Frank L. Boyden
Easthampton	Williston Academy	Archibald V. Galbraith
East Northfield	Northfield Seminary	Mira B. Wilson
Franklin	Dean Academy	Earle S. Wallace
Groton	Groton School	Endicott Peabody
Groton	Lawrence Academy	Fred Clifton Gray
Hingham	Derby Academy	H. M. Davis, Jr.
Kendall Green	The Cambridge School, Inc.	John R. D. French
Lowell	Rogers Hall	Katharine W. McGay
Marion	Tabor Academy	Walter H. Lillard
Milton	Milton Academy	Wm. L. W. Field
Mt. Hermon	Mount Hermon School	David R. Porter
Natick	Walnut Hill School	Hester R. Davies
Newton	The Country Day School for Boys	W. Linwood Chase
North Andover	Brooks School	Frank D. Ashburn
Norton	House in the Pines	Mrs. G. C. Milliken
Pittsfield	Miss Hall's School	Margaret H. Hall
Sheffield	Berkshire School	Seaver B. Buck
Southborough	St. Mark's School	Francis Parkman
South Braintree	Thayer Academy	Stacy B. Southworth
South Byfield	Governor Dummer Academy	Edward W. Eames
Springfield	The MacDuffie School	M. A. MacDuffie
Wellesley	Academy of the Assumption	Sister Maris Stella
Wellesley	Dana Hall Schools	Helen Temple Cooke
West Bridgewater	Howard Seminary	Mrs. M. E. Peters
Weston	The Cambridge School	John R. P. French
West Roxbury	Roxbury Latin School	George N. Northrop
Wilbraham	Wilbraham Academy	Charles L. Stevens
Worcester	Bancroft School	Bradford M. Kingman
Worcester	Worcester Academy	Harold H. Wade

Michigan

Bloomfield Hills	Cranbrook School	R. D. Lindquist
Bloomfield Hills	Kingswood School Cranbrook	Margaret A. Augur
Grosse Pointe	Detroit University School	Daniel H. Fletcher
Detroit	The Liggett School	Katharine Ogden
Detroit	Miss Newman's School	Mary Newman

Minnesota

Duluth	Stanbrook Hall	Sister M. Raymond
Faribault	St. Mary's Hall	Margaret Robertson
Faribault	Shattuck School	James S. Guernsey
Minneapolis	The Blake School	Eugene C. Alder
Minneapolis	Minnehaha Academy	J. R. Adell
Minneapolis	Northrop Collegiate School	Ethel M. Spurr
Owatonna	Pillsbury Academy	Milo B. Price
St. Paul	Oak Hall	Royal A. Moore
St. Paul	St. Paul Academy	John DeQ. Briggs
St. Paul	The Summit School	Sarah Converse

Mississippi

Blue Mountain	Mississippi Heights Academy	J. E. Brown
Gulfport	Gulf Coast Military Academy	Nat Owen
Port Gibson	Chamberlain-Hunt Academy	J. W. Kennedy

City	Institution	Head
Missouri		
Boonville	Kemper Military School	A. M. Hitch
Clayton	John Burroughs School	Leonard D. Haertter
Clayton	Chaminade College Academy	V. B. Braun
Columbia	University High School	L. G. Townsend
Kansas City	Barstow School	Winifred H. Turner
Kansas City	Pembroke-Country Day School	Howard E. A. Jones
Kansas City	Sunset Hill School for Girls	Mrs. Leland Hazard
Lexington	Wentworth Military Academy	J. M. Sellers, Supt.
Mexico	Missouri Military Academy	Marpuess Wallace
Point Lookout	The School of the Ozarks	R. M. Good
St. Louis	Mary Institute	Charles H. Garrison
St. Louis	The Principia	William E. Morgan
St. Louis	St. Louis Country Day School	Robert H. B. Thompson
Nebraska		
Omaha	Brownell Hall	Marguerite H. Wickenden
Omaha	Pratt School of Individual Instruction	Mrs. C. F. Pratt
New Hampshire		
Andover	Proctor Academy	Halsey Gulick
Center Strafford	Austin-Cate Academy	Clarence Cummings
Concord	St. Paul's School	Norman B. Nash
Derry	Pinkerton Academy	John H. Bell
Exeter	Phillips Exeter Academy	Lewis Perry
Exeter	Robinson Seminary	James A. Pirnie
Kingston	Sanborn Seminary	Raymond A. Hoyt
Meriden	Kimball Union Academy	William R. Brewster
New Hampton	New Hampton	Frederick Smith
Tilton	Tilton School and Junior College	James E. Coons
Wolfeboro	Brewster Free Academy	Walter G. Grennall, Jr.
New Jersey		
Blairstown	Blair Academy	Charles H. Breed
Bordentown	Bordentown Military Institute	H. M. Smith, J. H. Lucas, & D. Styer
Burlington	St. Mary's Hall	Edith M. Weller
Convent	Academy of St. Elizabeth	Sister Marie Josephine
Elizabeth	Pingry School	E. Laurence Springer
Elizabeth	The Vail-Deane School	Eleanor Denison
Englewood	Dwight School	Frances Leggett
Essex Falls	Kingsley School	N. P. Merrill, Acting
Gladstone	St. Bernard's School	H. D. Nicholls
Hightstown	Peddie School	Wilbour E. Saunders
Hoboken	Stevens Hoboken Academy	B. F. Carter
Jersey City	Bergen School for Girls	Louise W. Moora
Lakewood	Newman School	William M. Agar
Lawrenceville	The Lawrenceville School	Allan V. Heely
Montclair	The Kimberley School	Mary K. Waring
Montclair	Montclair Academy	Walter D. Head
Moorestown	Moorestown Friends School	Chester L. Reagan
Morristown	Morristown School	George H. Tilghman
Newark	Newark Academy	Clinton F. Zerweck
Newark	Newark Preparatory and Commercial School	Leon Terry
Newark	Prospect Hill Country Day School	Albert A. Hamblen
New Brunswick	Rutgers Preparatory School	Stanley Shepard, Jr.
Orange	Miss Beard's School	Lucie C. Beard
Orange	Carteret Academy	George G. Grim
Pennington	Pennington School	Francis Harvey Green
Plainfield	The Hartridge School	Emelyn B. Hartridge
Plainfield	Wardlaw School	C. D. Wardlaw
Princeton	Miss Fine's School	Katherine B. Shippen
Princeton	Hun School	John G. Hun
Summit	Kent Place School	Harriet L. Hunt
Toms River	Admiral Farragut Academy	S. S. Robinson, Supt.
New Mexico		
Roswell	New Mexico Military Institute	D. C. Pearson
New York		
Albany	Academy of the Holy Names	Sister M. Judith
Albany	The Albany Academy	Islay F. McCormick
Albany	Albany Academy for Girls	Margaret Trotter
Albany	St. Agnes School	Blanche Pittman
Bronxville	Brantwood Hall	Mary T. Maine
Brooklyn	Adelphi Academy	William Slater
Brooklyn	Berkeley Institute	Ina C. Atwood
Brooklyn	Brooklyn Academy	Chas. W. Cortright
Brooklyn	Brooklyn Friends School	Douglas G. Grafflin
Brooklyn	Brooklyn Preparatory School	John H. Klocke
Brooklyn	Colby Academy	Walter S. Meyer
Brooklyn	The Packer Collegiate Institute	Paul D. Shafer
Brooklyn	Polytechnic Preparatory Country Day School	Joseph Dana Allen
Brooklyn	Shore Road Academy	Theodora Goldsmith
Buffalo	The Buffalo Seminary	L. Gertrude Angell
Buffalo	The Franklin School	Janet Crawford
Buffalo	Nichols School	Philip M. B. Boocock
Carmel	Drew Seminary for Young Women	Herbert Wright
Cazenovia	The Cazenovia Seminary	Harold W. Hebblethwaite
Cooperstown	Knox School	Mrs. E. Russell Houghton
Cornwall	New York Military Academy	Milton F. Davis
Dobbs Ferry	The Masters School	Evelina Pierce
Flushing	The Foxwood School	Elizabeth C. Dresser
Forest Hills	Kew-Forest School	Louis D. Marriott
Garden City	Cathedral School of St. Mary	Marion B. Reid
Garden City	St. Paul's School	Walter R. Marsh
Jackson Heights	Garden Country Day School	O. P. Flower
Lake Placid Club	Northwood School	Ira A. Flinner
Lakemont	Palmer Institute-Starkey Seminary	James P. Long
Lima	Genesee Wesleyan Seminary	C. W. Spangle, Dean
Locust Valley	Friends Academy	Harold A. Nomer
Manlius	Manlius School	Guido F. Verbeck
Millbrook	The Bennett School and Junior College	Courtney Carroll
Montour Falls	Cook Academy	Bert C. Cate
New Hartford	Utica Country Day School	Raymond B. Johnson
New York	Academy Mount Saint Vincent	Sister Maria
New York	All Hallows Institute	P. A. Gleeson
New York	The Barnard School for Boys	William L. Hazen
New York	The Barnard School for Girls	Margaret D. Gillette
New York	Bentley School	Bertha M. Bentley
New York	The Berkeley-Irving School	Louis C. Woodruff
New York	Birch Wathen School	Louise Birch
New York	The Brearley School	Mrs. Rustin McIntosh
New York	The Calhoun School	Mary E. Calhoun
New York	The Chapin School, Ltd.	Ethel Stringfellow
New York	Collegiate School	Wilson Parkhill
New York	Columbia Grammar School	Frederic A. Alden
New York	The Dalton Schools, Inc.	Helen Parkhurst
New York	Ethical Culture Schools	V. T. Thayer
New York	Franklin School	Clifford W. Hall
New York	Friends Seminary	Henry L. Messner
New York	The Gardner School	M. Elizabeth Masland
New York	The Lenox School	Olivia Green
New York	Lincoln School of Teachers College	Lester Dix
New York	Horace Mann School	Rollo G. Reynolds
New York	Horace Mann School for Boys	Charles C. Tillinghast
New York	McBurney School	Thomas Hemenway
New York	New York Preparatory School	Ernest Greenwood
New York	Rhodes School	David Goodman
New York	The Riverside School	Margaret E. Wells
New York	St. Agatha	Muriel Bowden
New York	St. Ann's Academy	Brother Marcel Henry Michael
New York	Scudder School	James E. Lough
New York	The Spence School	Mrs. Harold S. Osborne
New York	The Todhunter School	Marion Dickerman
New York	Trinity School	M. E. Dann
New York	Walden School	C. Elizabeth Goldsmith
Niagara Falls	DeVeaux School	George L. Barton, Jr.
Oakdale	La Salle Military Academy	Brother Ambrose
Pawling	Pawling School	R. J. Shortlidge
Peekskill	The Peekskill Military Academy	John C. Bucher
Peekskill	St. Mary's School	Sister Mary Regina
Poughkeepsie	Oakwood School	William J. Reagan
Riverdale	Riverdale Country School	Frank S. Hackett
Rochester	Allendale School	John R. Webster
Rochester	Columbia School	Mrs. D. E. Simpson
Rochester	The Harley School	Louise M. Sumner
Rye	Rye Country Day School	Morton Snyder
Scarborough	Scarborough School	F. Dean McClusky
Schenectady	The Brown School	Amy Kermeth
Snyder	The Park School of Buffalo	M. A. Cheek, Jr.
Staten Island	Notre Dame Academy	Mother St. Margaret
Staten Island	Staten Island Academy	Stephen J. Botsford
Stony Brook	The Stony Brook School	Frank E. Gaebelein
Syracuse	Goodyear-Burlingame School	Marion S. Edwards
Tarrytown	The Hackley School	Walter B. Gage
Tarrytown	Highland Manor School & Junior College	Eugene H. Lehman
Tarrytown	Irving School	C. W. Olson
Tarrytown	Marymount School	M. St. Clare
Troy	Emma Willard School	Eliza Kellas
Troy	La Salle Institute	Brother Raymond
Woodmere	Woodmere Academy	Horace M. Perry

City	Institution	Head
North Carolina		
Asheville	Asheville School	David R. Fall
Asheville	St. Genevieve-of-the-Pines	Mother Lorin
Beaufort	St. Paul's School	
Buie's Creek	Campbell College & Academy	L. H. Campbell
Hendersonville	Fassifern School	Joseph R. Sevier
Oak Ridge	Oak Ridge Military Institute	Earle P. Holt
Star	Country Life Academy	E. F. Green
Winston Salem	Salem Academy	Mary A. Weaver
North Dakota		
Fargo	Oak Grove Seminary	T. H. Quanbeck
Ohio		
Akron	Old Trail School	Eugene M. Hinton
Barnesville	Friends Boarding School	Blanche E. Schofield
Cincinnati	College Preparatory School	Ruth R. Jones
Cincinnati	Hillsdale	Miss Florence E. Fessenden
Cincinnati	University School	C. L. S. Easton
Cleveland	Hathaway-Brown School	
Cleveland	Laurel School	Edna F. Lake
Cleveland	The University School	Harry A. Peters
Columbus	The Columbus Academy	Frank P. R. Van Syckel
Columbus	The Columbus School for Girls	Samuel Shellabarger
Hudson	Western Reserve Academy	Joel B. Hayden
Maumee	Maumee Valley Country Day School	Willis Stork, Acting
Mt. St. Joseph	Mt. St. Joseph Academy	Sister Dorothea
Mt. Vernon	Mt. Vernon Academy	V. P. Lovell
Reading	Mount Notre Dame Academy	Sister Eleanor Josephine
Oregon		
Gaston	Laurelwood Academy	G. H. Simpson
Portland	The Catlin School	Ruth Catlin
Portland	Hill Military Academy	Joseph A. Hill
Portland	St. Helen's Hall	Sister Superior
Pennsylvania		
Allentown	Allentown Preparatory School	Louis F. Hackemann
Ardmore	The Holman School	Elizabeth W. Braley
Birmingham	The Grier School	Thomas C. Grier
Bryn Mawr	The Baldwin School	Elizabeth F. Johnson
Bryn Mawr	The Shipley School	Alice G. Howland
Forty Fort	The Wilkes-Barre Institute	Oscar N. Barber
George School	George School	George A. Walton
Harrisburg	Harrisburg Academy	Arthur E. Brown
Haverford	Haverford School	Cornelius B. Boocock
Hollidaysburg	Highland Hall	Elizabeth G. Baldwin
Kingston	Wyoming Seminary	Wilbur H. Fleck
Lancaster	Franklin & Marshall Academy	E. M. Hartman
Lancaster	The Shippen School	Eleanor Fitzpatrick
Latrobe	St. Xavier Academy	Sister M. Regis
Lititz	Linden Hall	F. W. Stengel
Mercersburg	The Mercersburg Academy	Boyd Edwards
New Bloomfield	Carson Long Institute	Edward L. Holman
Overbrook	The Episcopal Academy	Greville G. Haslam
Overbrook	Friends Central School	Barclay L. Jones
Pennsburg	Perkiomen School	Clarence E. Tobias, Jr.
Philadelphia	Brown Preparatory School	George J. Brown
Philadelphia	Carson College for Orphan Girls	Elsa Ueland
Philadelphia	Chestnut Hill Academy	Frederic E. Camp
Philadelphia	Convent of the Sacred Heart	Mother M. Helen Lucas
Philadelphia	Friends' Select School	Walter W. Haviland
Philadelphia	Germantown Academy	Samuel E. Osbourn
Philadelphia	Germantown Friends School	Stanley R. Yarnall
Philadelphia	The Lankenau School	E. F. Bachmann
Philadelphia	Mount St. Joseph Academy	Mother Directress, Sisters of St. Joseph
Philadelphia	Oak Lane Country Day School	George H. Ivins
Philadelphia	The William Penn Charter School	Richard Knowles
Philadelphia	Springside School	Mrs. Samuel H. Paul
Philadelphia	Stevens School	Helen L. Church
Philadelphia	Temple University High School	Charles E. Metzger
Pittsburgh	Arnold School	Roger B. Merriman, Jr.
Pittsburgh	The Ellis School	Sara Frazer Ellis
Pittsburgh	Shady Side Academy	E. Trudeau Thomas
Pittsburgh	The University School	Guy H. Baskerville
Pittsburgh	The Winchester-Thurston School	Mary A. G. Mitchell
Pottstown	The Hill School	James I. Wendell
Rydal	Ogontz School	Abby A. Sutherland
Saltsburg	Kiskiminetas Springs School	John J. Daub
Susquehanna	Laurel Hill Academy	James A. Walsh
Swarthmore	The Mary Lyon School, Inc.	Haldy M. Crist
Torresdale	Eden Hall	Mother H. Moclair
Washington	Washington Seminary	Jane C. Maxfield
Wayne	Valley Forge Military Academy	Milton G. Baker
Westtown	Westtown School	James F. Walker
Williamsport	Williamsport Dickinson Seminary	John W. Long
Wynnewood	The Agnes Irwin School	Bertha M. Laws
York	York Collegiate Institute	Lester F. Johnson
Rhode Island		
East Greenwich	East Greenwich Academy	Ira W. LeBaron
Newport	St. George's School	J. Vaughan Merrick
Portsmouth	Portsmouth Priory School	J. Hugh Diman
Providence	Lincoln School	Amy L. Philips
Providence	The Mary C. Wheeler School	Mary Helena Dey
Providence	The Moses Brown School	L. Ralston Thomas
South Carolina		
Aiken	Fermata School	Scott Clark
Bamberg	Carlisle School	James F. Risher
Charleston	Ashley Hall	Mary V. McBee
Greenwood	Bailey Military Academy	James D. Fulp
Tennessee		
Baxter	Baxter Seminary	Harry L. Upperman
Bell Buckle	Webb School	W. R. Webb
Butler	Watauga Academy	C. A. Todd
Chattanooga	Baylor School	Herbert B. Barks
Chattanooga	Girls' Preparatory School	Tommie P. Duffy
Chattanooga	The McCallie School	S. J. McCallie
Collegedale	Southern Junior College	J. C. Thompson
Columbia	Columbia Military Academy	L. U. Ragsdale, Supt.
Franklin	Battle Ground Academy	George I. Briggs
Lebanon	Castle Heights Military Academy	Harry L. Armstrong
Memphis	Miss Hutchison's School	Mary G. Hutchison
Nashville	Peabody Demonstration School	J. E. Windrou
Petersburg	Morgan School	R. Kenneth Morgan, Jr.
Pleasant Hill	Pleasant Hill Academy	Victor Obenhaus
Sewanee	Sewanee Military Academy	C. A. Tasuk
Sweetwater	Tennessee Military Institute	C. R. Endsley
Texas		
Bryan	Allen Academy	N. B. Allen
Dallas	Hockaday School for Girls	Ela Hockaday
Dallas	Terrill Preparatory School & Junior College	S. M. Davis
El Paso	Radford School for Girls	L. deL. Templin
Houston	Kinkaid School	Mrs. W. J. Kinkaid
Houston	St. Thomas College High School	A. L. Higgins
Laredo	Holding Institute	Anton Deschner, Supt.
San Antonio	Peacock Military Academy	Wesley Peacock, Jr.
San Antonio	Texas Military Institute	W. W. Bondurant
San Marcos	San Marcos Academy	R. M. Cavness
Utah		
Salt Lake City	Rowland Hall	Wilfrida Messenger
Vermont		
Lyndon Center	Lyndon Institute	O. D. Mathewson
Manchester	Burr & Burton Seminary	Ralph E. Howes
Putney	The Putney School	Mrs. Carmelita Hinton
St. Johnsbury	St. Johnsbury Academy	Stanley R. Oldham
Saxtons River	Vermont Academy	Lawrence G. Leavitt
Virginia		
Alexandria	Episcopal High School	A. R. Hoxton
Alexandria	St. Agnes School, Inc.	Mrs. G. C. Macan
Chatham	Chatham Hall	Edmund J. Lee
Chatham	Hargrave Military Academy	Aubrey H. Camden
Danville	Danville Military Institute	Thomas Wilborn
Fork Union	Fork Union Military Academy	J. J. Wicker
Fort Defiance	Augusta Military Academy	Thos. J. Roller

City	Institution	Head
Front Royal	Randolph-Macon Academy	John C. Boggs
Greenway	The Madeira School	Mrs. David Wing
Lynchburg	Virginia Episcopal School	Oscar deW. Randolph
Middleburg	Foxcroft School	Charlotte H. Noland
Richmond	The Collegiate School for Girls	Mrs. Wm. T. Hodges
Richmond	McGuire's University School	John P. McGuire
Richmond	St. Catherine's School	Mrs. Jeffrey R. Brackett
Richmond	St. Christopher's School	C. G. Chamberlayne
Staunton	Staunton Military Academy	Roy W. Wonson
Staunton	Stuart Hall	Ophelia S. T. Carr
Warrenton	Warrenton Country School	Lea M. Bouligny
Waynesboro	Fairfax Hall Junior College	W. B. Gates
Waynesboro	Fishburne Military School	M. H. Hudgins
Woodberry Forest	Woodberry Forest School	J. Carter Walker
Woodstock	Massanutten Academy	H. J. Benchoff
Washington		
Seattle	Helen Bush School	Helen T. Bush
Seattle	Saint Nicholas School	Fanny C. Steele
Tacoma	Annie Wright Seminary	Sallie E. Wilson
West Virginia		
Lewisburg	Greenbrier Military School	H. B. Moore
Wisconsin		
Delafield	St. John's Military Academy	Roy F. Farrand
Kenosha	Kemper Hall	Mother Mary Ambrose
Lake Geneva	Northwestern Military & Naval Academy	R. P. Davidson
Milwaukee	Milwaukee Country Day School	A. Gledden Santer
Milwaukee	Milwaukee-Downer Seminary	Helen K. Burtt Mason
Milwaukee	Milwaukee University School	Frank S. Spigener
Prairie du Chien	Campion Jesuit High School	Albert J. Muntsch
Canada		
Montreal, Que.	Lower Canada College	V. C. Wansbrough
Montreal, Que.	Loyola High School	Hugh C. McCarthy
Montreal, Que.	Mt. St. Louis College	Brother Anselme
Quebec, Que.	Ursuline College	M. S. Clotilde
Sackville, N. B.	Mt. Allison Academy and Commercial College	W. T. R. Flemington
Toronto, Ont.	Bishop Strachan School	E. M. Lowe
Toronto, Ont.	Branksome Hall	Edith M. Read
Toronto, Ont.	Havergal College	G. E. Millard
Toronto, Ont.	St. Joseph's College School	Sister Maura
Winnipeg, Man.	St. John's College School	W. Burman
Wolfville, N. S.	Horton Academy	E. W. Robinson
Cuba		
Habana	Cathedral School	Mary C. Nichols
Hawaii		
Honolulu	Kamehameha Schools	Homer F. Barnes
Philippine Islands		
Baguio	Brent School	A. H. Richardson

SECTION XVI

SUPERINTENDENTS OF SCHOOLS IN PLACES OF 5000 POPULATION AND OVER

In the following list are included all places which are known to have a superintendent of schools and which, according to the 1930 Federal Census, have a population of 5,000 or over. These include incorporated cities, towns, boroughs and villages, unincorporated towns (in New England), and townships classified as urban by the Bureau of the Census. The names of the superintendents have been revised to December, 1938, and in some cases more recently.

References

(a) County superintendent. (b) Parish superintendent. (c) Supervising principal.

City	*Superintendent*
Alabama	
Andalusia	C. L. Martin
Anniston	C. C. Moseley
Bessemer	J. Clyde Orr
Birmingham	C. B. Glenn
Decatur	S. E. Alverson
Dothan	Bruce Flurry
Eufaula	T. G. Wilkinson
Fairfield	B. B. Baker
Florence	J. W. Powell
Gadsden	C. A. Donehoo
Huntsville	W. G. Hamm
Jasper	G. T. Patrick
Lanett	Taylor H. Kirby
Mobile	W. C. Griggs (a)
Montgomery	C. M. Dannelly (a)
Opelika	R. B. Mardre
Phenix City	L. P. Stough
Selma	Walter M. Jackson
Sheffield	C. M. Brewster
Talladega	Frank L. Harwell
Tarrant	W. A. Parker
Troy	L. D. Bynum
Tuscaloosa	H. G. Dowling
Arizona	
Bisbee	R. E. Souers
Douglas	J. E. Carlson, Jr.
Globe	H. E. Stevenson
Miami	Ivan P. Hostetter
Morenci	W. E. Lutz
Nogales	A. J. Mitchell
Phoenix	John D. Loper (Elementary) E. W. Montgomery (High)
Prescott	Donald Sheldon
Tucson	C. E. Rose
Arkansas	
Blytheville	W. D. McClurkin
Camden	F. W. Whiteside
Conway	B. A. Short
El Dorado	J. I. McClurkin
Fayetteville	Frank S. Root
Fort Smith	J. W. Ramsey
Helena	J. F. Wahl
Hope	Miss Beryl Henry
Hot Springs National Park	Harvey H. Haley
Jonesboro	R. H. Moore
Little Rock	R. C. Hall
Malvern	J. L. Pratt
No. Little Rock	R. A. Cox
Paragould	Rufus D. Haynes
Pine Bluff	J. R. Allen
Russellville	W. E. Phipps
Texarkana	P. N. Bragg
Van Buren	Virgle Coleman
California	
Alameda	Wm. G. Paden
Albany	Allen Keim
Alhambra	Geo. E. Bettinger
Anaheim	M. A. Gauer (Elementary) J. A. Clayes (High)
Arcadia	Elmer E. Westerhouse
Bakersfield	L. E. Chenoweth
Berkeley	Virgil E. Dickson
Beverly Hills	E. J. Hummel
Brawley	Geo. K. Anderson
Burbank	B. F. Enyeart
Burlingame	L. D. Henderson
Calexico	J. W. Lawson
Chico	F. F. Martin
Colton	J. H. Waldron
Compton	Ardella B. Tibbey (Elementary) O. S. Thompson (High)
Corona	Frank E. Bishop
Coronado	F. A. Boyer (Elementary) J. Leslie Cutler (High)
Culver City	Mrs. Helen D. Hayward
Daly City	R. L. Crane (Elementary) James Ferguson (High)
El Centro	Guy A. Weakley
Eureka	G. B. Albee
Fresno	Homer C. Wilson
Fullerton	R. E. Green (Elementary) Louis E. Plummer (High)
Glendale	Willard S. Ford
Hanford	C. E. Denham
Hawthorne	Dan T. Williams
Hayward	Robert M. Reid (Elementary) H. B. Long (High)
Inglewood	George M. Green (High) Robert E. Cralle (Elementary)
Lodi	LeRoy Nichols
Long Beach	K. E. Oberholtzer
Los Angeles	Vierling Kersey
Lynwood	W. R. Fouts
Martinez	Forrest V. Routt
Marysville	W. A. Kynoch
Merced	W. M. Smith (Elementary) A. W. Meany (High)
Modesto	J. H. Bradley
Monrovia	J. Warren Ayer
Montebello	Mark R. Jacobs
Monterey	J. R. Croad (Elementary) J. R. McKillop (High)
Napa	Irene Snow (Elementary) E. E. Crawford (High)
National City	Fred M. Tonge (Elementary) J. M. McDonald (High)
Oakland	E. W. Jacobsen
Ontario	C. W. Randall (Elementary) Gardiner W. Spring (High)
Orange	Carl Thomas
Oxnard	R. B. Haydock
Pacific Grove	R. H. Down
Palo Alto	J. R. Overturf
Pasadena	J. A. Sexson
Petaluma	David M. Durst
Piedmont	Harry W. Jones
Pittsburg	F. S. Ramsdell
Pomona	Emmett Clark
Porterville	Emmet R. Berry
Redlands	John Branigan
Redondo Beach	Harry P. McCandless (Elementary) Aileen S. Hammond (High)
Redwood City	Andrew Spinas
Richmond	W. T. Helms
Riverside	Ira C. Landis
Roseville	W. T. Eich
Sacramento	C. C. Hughes
Salinas	R. D. Case
San Bernardino	Albert D. Graves
San Diego	Will C. Crawford
San Francisco	J. P. Nourse
San Gabriel	R. B. Walter
San Jose	W. L. Bachrodt
San Leandro	Andrew J. Cartwright
San Luis Obispo	Charles E. Teach
San Mateo	Leil L. Young (Elementary) Homer Martin (High)
San Rafael	O. R. Hartzell
Santa Ana	Frank A. Henderson
Santa Barbara	Curtis E. Warren
Santa Cruz	Roy E. Simpson
Santa Maria	Robert Bruce (Elementary) Andrew P. Hill, Jr. (High)
Santa Monica	Percy R. Davis
Santa Paula	George A. Bond (Elementary) F. M. Eakin (High)
Santa Rosa	Jerome O. Cross
South Pasadena	George C. Bush
South San Francisco	A. C. Kleemeyer (c)
Stockton	Ansel S. Williams
Taft	James A. Joyce
Tulare	W. B. Knokey
Vallejo	Elmer L. Cave
Ventura	James M. Sexton
Visalia	DeWitt Montgomery
Watsonville	T. S. MacQuiddy
Whittier	Will Wiley (Elementary) D. A. Stouffer (High)
Woodland	Mrs. E. Bandy
Colorado	
Alamosa	G. P. Young
Boulder	Virgil M. Rogers
Canon City	L. L. Beahm
Colorado Springs	H. M. Corning
Denver	A. J. Stoddard
Durango	Emory E. Smiley
Englewood	R. D. Jenkins
Fort Collins	Ward I. Miller
Grand Junction	J. Fred Essig
Greeley	Hubert D. Eldridge
La Junta	G. T. Wilson
Longmont	Kent L. Sanborn
Loveland	R. W. Truscott
Pueblo	District No. 1, J. H. Risley District No. 20, Ray E. Redmond
Salida	L. D. Hightower
Sterling	R. R. Knowles
Trinidad	William R. Ross
Walsenburg	S. M. Andrews

City	Superintendent
Connecticut	
Ansonia	John J. Stevens
Bridgeport	Worcester Warren
Bristol	Karl A. Reiche
Danbury	Harold F. Dow
Darien	Edward H. Fuller
Derby	Richard T. Tobin
E. Hartford	P. S. Barnes
E. Haven	W. E. Gillis
Enfield	E. H. Parkman
Fairfield	A. M. McCullough
Glastonbury	Francis S. Knox
Greenwich	Maynard W. Linn
Griswold	Ernest Lake
Groton	S. B. Butler
Hamden	Margaret L. Keefe
Hartford	Fred D. Wish, Jr.
Killingly	Samuel H. White
Manchester	Arthur H. Illing
Meriden	R. N. Brown
Middletown	Fred W. Shearer
Middletown (twp.)	Van Buren Moody
Milford	C. W. Maddocks
Naugatuck	H. E. Chittenden
New Britain	C. C. Ring
New Haven	J. A. Fitzgerald
New London	Warren A. Hanson
Norwalk	Philip A. Jakob
Norwich	E. J. Graham
Plainfield	J. L. Chapman
Plainville	Harold W. Thomas
Plymouth	H. S. Fisher
Putnam	Thomas W. Mahan
Rockville	Philip M. Howe
Seymour	H. L. Adams
Shelton	Harry E. Fowler
Southington	William Strong
Stafford	Earl M. Witt
Stamford	Leon C. Staples
Stonington	R. D. Tucker
Stratford	E. Ward Ireland
Torrington	G. J. Vogel
Vernon	P. M. Howe
Wallingford	H. M. Jeffords
Waterbury	Thomas J. Condon
Watertown	G. C. Swift
West Hartford	Lloyd H. Bugbee
West Haven	Seth G. Haley
Westport	Heath E. White
Wethersfield	Wilson Greer
Windham	Egbert A. Case
Windsor	Earle S. Russell
Winsted	L. R. McKusick
Delaware	
Wilmington	S. M. Stouffer
District of Columbia	
Washington	Frank W. Ballou
Florida	
Bartow	C. I. Hollingsworth (a)
Bradenton	Jessie P. Miller (a)
Clearwater	G. V. Fuguitt (a)
Coral Gables	J. T. Wilson (a) (Address Miami)
Daytona Beach	G. W. Marks (a) (Address Deland)
Deland	G. W. Marks (a)
Fort Lauderdale	Ulric J. Bennett (a)
Fort Myers	Harry F. Hendry (a)
Gainesville	Horace F. Zetrouer (a)
Jacksonville	R. C. Marshall (a)
Key West	M. E. Russell (a)
Lakeland	C. I. Hollingsworth (a) (Address Bartow)
Lake Worth	John I. Leonard (a) (Address W. Palm Beach)
Miami	J. T. Wilson (a)
Miami Beach	J. T. Wilson (a) (Address Miami)
Ocala	Don T. Mann (a)
Orlando	Judson B. Walker (a)
Palatka	L. S. Barstow (a)
Panama City	A. L. Hardy (a)
Pensacola	J. H. Varnum (a)
Plant City	E. L. Robinson (a) (Address Tampa)
River Junction	C. H. Gray (a) (Address Quincy)
St. Augustine	D. D. Corbett (a)
St. Petersburg	G. V. Fuguitt (a) (Address Clearwater)
Sanford	T. W. Lawton (a)
Sarasota	T. W. Yarbrough (a)
Tallahassee	F. A. Rhodes (a)
Tampa	E. L. Robinson (a)
West Palm Beach	John I. Leonard (a)
Winter Haven	C. I. Hollingsworth (a) (Address Bartow)
Georgia	
Albany	J. O. Allen
Americus	S. C. Haddock
Athens	B. M. Grier
Atlanta	W. A. Sutton
Augusta	S. D. Copeland (a)
Bainbridge	E. G. Elcan
Brunswick	G. W. Wannamaker (a)
Carrollton	M. C. Wiley
Cartersville	W. H. Brandon
Cedartown	J. E. Purks
Columbus	Paul Munro
Cordele	D. H. Standard
Dalton	W. W. Stancil
Decatur	Lamar Ferguson
Dublin	A. J. Hargrove
East Point	Jere Wells (a)
Fitzgerald	Fred Ayres
Gainesville	C. J. Cheves
Griffin	J. L. Fortney
Lagrange	F. F. Rowe
Macon	W. P. Jones (a)
Marietta	C. A. Keith
Milledgeville	P. N. Bivins (a)
Moultrie	J. L. Yaden
Newnan	C. B. Mathews
Rome	B. F. Quigg
Savannah	O. B. Strong (a)
Thomasville	N. M. Huckabee
Valdosta	A. G. Cleveland
Waycross	Ralph Newton
Idaho	
Boise	W. D. Vincent
Coeur d'Alene	G. O. Phippeny
Idaho Falls	W. W. Christensen
Lewiston	Glenn W. Todd
Nampa	J. E. Walsh
Pocatello	E. Norman Vaughn
Twin Falls	Homer Davis
Illinois	
Alton	W. R. Curtis
Argo-Summit	Clarence Barrett
Aurora	K. D. Waldo (East Side) C. E. Larson (West Side)
Batavia	John B. Nelson
Beardstown	W. L. Gard
Belleville	H. V. Calhoun
Belvidere	R. E. Garrett
Benton	Charles M. Johnson
Berwyn	William Hawkes (Dist. No. 98) E. W. Martin (Dist. No. 100)
Bloomington	Paul Gossard
Blue Island	H. A. Perrin
Brookfield	E. N. Cassady
Cairo	Leo C. Schultz
Calumet City	Eric E. Brown
Canton	Ben Kietzman
Carbondale	Raymond Hoffner
Centralia	R. V. Jordon
Champaign	V. L. Nickell
Charleston	U. B. Jeffries
Chicago	Wm. H. Johnson
Chicago Heights	Ben A. Sylla
Cicero	G. A. Schwebel
Clinton	F. D. Merriman
Collinsville	E. B. Burroughs
Danville	C. E. Vance
Decatur	William Harris
De Kalb	F. W. Phillips
Des Plaines	E. R. Selleck
Dixon	A. H. Lancaster
Downers Grove	George De Wolf
Dundee	H. D. Jacobs
Duquoin	Oren McClure
East Moline	D. B. Hoffman
East Peoria	Paul L. Bolin
East St. Louis	D. Walter Potts
Edwardsville	E. L. Alexander
Elgin	O. F. Patterson
Elmhurst	V. L. Beggs
Elmwood Park	George N. Wells
Evanston	J. R. Skiles (Dist. No. 75) David E. Walker (Dist. No. 76)
Forest Park	W. S. Dimmett
Freeport	B. F. Shafer
Galesburg	Richard V. Lindsey
Gillespie	J. W. White
Glencoe	Paul J. Misner
Glen Ellyn	S. A. Denison
Granite City	A. M. Wilson
Harrisburg	W. Russell Malan
Harvey	C. C. Thompson
Herrin	John R. Creek
Highland Park	R. H. Price (Dist. No. 107) Clark G. Wright (Dist. No. 108)
Hinsdale	Martin B. Travis
Hoopeston	W. R. Lowery
Jacksonville	R. O. Stoops
Johnston City	Earl E. Miller
Joliet	G. N. Hufford
Kankakee	Irving Munson
Kewanee	Charles A. Bruner
La Grange	J. C. Davies
Lake Forest	Melvin G. Davis
La Salle	J. B. McManus
Lawrenceville	M. N. Todd
Lincoln	D. F. Nickols
Litchfield	Oscar M. Chute
Lombard	Mrs. Ada Manning
Macomb	C. S. Chappelear
Madison	E. W. Heob
Marion	H. O. Belford
Mattoon	H. B. Black
Maywood	Eugene La Rowe
Melrose Park	Eugene La Rowe
Metropolis	C. J. Ramsay
Moline	E. P. Nutting
Monmouth	LeRoy Fetherston
Morris	B. R. Bowden
Mount Carmel	R. S. Condrey
Mount Vernon	J. Lester Buford
Murphysboro	Wm. H. Carruthers
Naperville	R. E. Beebe
Niles Center	R. E. Cotanche
Normal	Monroe Melton
North Chicago	F. E. De Yoe (Dist. No. 63) R. L. Newenham (Dist. No. 64)
Oak Park	W. J. Hamilton
Olney	C. T. Cramer
Ottawa	C. J. Byrne
Pana	Hamilton Hale
Paris	John R. Moss
Park Ridge	Harry D. Winslow
Pekin	C. B. Smith
Peoria	E. C. Fisher
Peru	C. W. Martin
Pontiac	A. F. Speltz
Quincy	R. O. Evans
River Forest	Ray E. Cheney
Riverside	L. J. Hauser
Rockford	Selmer H. Berg
Rock Island	Earl H. Hanson
St. Charles	G. E. Thompson
Savanna	W. D. Waldrip
Springfield	R. E. Fildes
Spring Valley	James Nesti
Sterling	O. A. Fackler (Dist. No. 11) H. U. Challand (Dist. No. 10)
Streator	H. K. Whittier
Summit	C. B. Barrett
Taylorville	Warren P. Shepherd
Urbana	T. H. Cobb
Venice	J. H. Gore
Villa Park	H. E. Hinkel
Waukegan	John S. Clark
West Frankfort	C. A. Waller
Wheaton	K. K. Tibbetts
Wilmette	J. R. Harper
Winnetka	C. W. Washburne
Wood River	G. A. Smith
Woodstock	W. J. Colahan
Zion	Edgar T. Stephens

City	*Superintendent*

Indiana

Anderson	Arthur Campbell
Auburn	H. L. McKenney
Bedford	H. H. Mourer
Bicknell	Harold Axe
Bloomington	H. E. Binford
Bluffton	L. R. Willey
Brazil	C. P. Keller
Clinton	E. C. Boyd
Columbus	Donald Du Shane
Connersville	E. C. Dodson
Crawfordsville	M. C. Darnall
Decatur	Walter J. Krick
East Chicago	Roy Feik
Elkhart	J. F. Wiley
Elwood	William F. Smith
Evansville	Ralph Irons
Fort Wayne	Merle Abbett
Frankfort	M. N. O'Bannon
Franklin	R. W. Sheek
Gary	H. S. Jones
Goshen	Ort L. Walter
Greensburg	Carl Billings
Hammond	L. L. Caldwell
Hartford City	Joseph C. Wagner
Hobart	J. M. Sellers
Huntington	C. E. Byers
Indianapolis	DeWitt S. Morgan
Jeffersonville	W. F. Vogel
Kendallville	H. M. Dixon
Kokomo	C. V. Haworth
Lafayette	Morris McCarty
La Porte	E. B. Wetherow
Lebanon	Paul Van Riper
Linton	T. J. Beecher
Logansport	Reed Groninger
Madison	E. O. Muncie
Marion	Elbert E. Day
Michigan City	Milo C. Murray
Mishawaka	P. C. Emmons
Mount Vernon	J. G. Turner
Muncie	H. B. Allman
New Albany	C. B. McLinn
New Castle	E. J. Llewelyn
Peru	J. P. Crodian
Plymouth	Ray Kuhn
Portland	J. C. Webb
Princeton	G. E. Derbyshire
Richmond	W. G. Bate
Rushville	L. A. Lockwood
Seymour	N. J. Lasher
Shelbyville	W. F. Loper
South Bend	Frank E. Allen
Sullivan	Dale C. Billman
Terre Haute	George C. Carroll
Valparaiso	Roy B. Julian
Vincennes	V. L. Eikenberry
Wabash	O. J. Neighbours
Warsaw	James M. Leffel
Washington	Clyde Parker
West Lafayette	F. A. Burtsfield
Whiting	W. W. Borden

Iowa

Ames	Jordan L. Larson
Atlantic	J. P. Street
Boone	H. J. Van Ness
Burlington	R. H. Bracewell
Cedar Falls	J. H. Peet
Cedar Rapids	Arthur Deamer
Centerville	E. W. Fannon
Chariton	J. R. Cougill
Charles City	P. C. Lapham
Cherokee	J. C. Hoglan
Clinton	M. M. Schell
Council Bluffs	J. A. True
Creston	Burton R. Jones
Davenport	Irvin H. Schmitt
Des Moines	A. W. Merrill
Dubuque	E. D. Cline
Fairfield	W. G. Pence
Fort Dodge	K. D. Miller
Fort Madison	A. I. Tiss
Iowa City	I. A. Opstad
Keokuk	R. L. Reid
Marshalltown	W. F. Shirley
Mason City	R. B. Irons
Muscatine	A. A. Johnson
Newton	B. C. Berg
Oelwein	R. D. Noble
Oskaloosa	R. J. Carroll
Ottumwa	Frank W. Douma
Perry	J. S. Vanderlinden
Red Oak	J. R. Inman
Shenandoah	W. Dean McKee
Sioux City	L. W. Feik
Spencer	H. J. Williams
Waterloo	J. M. Logan (East Side) Charles A. Kittrell (West Side)
Webster City	Burrus E. Beard

Kansas

Abilene	F. C. Gardner
Arkansas City	C. E. St. John
Atchison	W. D. Wolfe
Chanute	L. H. Petit
Coffeyville	K. W. McFarland
Concordia	E. B. Allbaugh
Dodge City	A. G. Schroedermeier
Eldorado	J. F. Hughes
Emporia	W. M. Richards
Fort Scott	V. M. Liston
Garden City	Ira O. Scott
Great Bend	H. C. Scarborough
Hutchinson	J. W. Gowans
Independence	J. H. Clement
Iola	John Fleming
Junction City	W. A. Wood
Kansas City	F. L. Schlagle
Lawrence	C. E. Birch
Leavenworth	I. J. Bright
Liberal	N. B. Mahuron
Manhattan	W. E. Sheffer
McPherson	R. W. Potwin
Newton	J. B. Heffelfinger
Ottawa	G. H. Marshall
Parsons	R. H. Hughes
Pittsburg	M. M. Rose
Pratt	Amos W. Glad
Salina	Chas. E. Hawkes
Topeka	A. J. Stout
Wellington	Claude Kissick
Wichita	L. W. Mayberry
Winfield	Evan E. Evans

Kentucky

Ashland	W. L. Brooker
Bellevue	W. H. Marshall
Bowling Green	L. C. Curry
Catlettsburg	J. T. Miracle
Corbin	G. W. Campbell
Covington	G. O. Swing
Danville	E. F. Birckhead
Dayton	Olin W. Davis
Fort Thomas	D. W. Bridges
Frankfort	J. W. Ireland
Glasgow	J. W. Depp
Hazard	R. T. Whittinghill
Henderson	C. E. Dudley
Hopkinsville	Gladstone Koffman
Jenkins	C. V. Snapp
Lexington	Henry H. Hill
Louisville	Zenos E. Scott
Ludlow	J. S. Brown
Madisonville	Harper Gatton
Mayfield	K. R. Patterson
Maysville	John Shaw
Middlesboro	J. W. Bradner
Newport	A. D. Owens
Owensboro	J. L. Foust
Paducah	H. L. Smith
Paris	Lee Kirkpatrick
Richmond	W. F. O'Donnell
Somerset	P. H. Hopkins
Winchester	B. B. Hodgkin

Louisiana

Alexandria	H. M. Wells (b)
Bastrop	E. D. Shaw (b)
Baton Rouge	C. B. Turner (b)
Bogalusa	J. N. Herrington
Crowley	A. T. Browne (b)
Gretna	J. C. Ellis (b)
Hammond	C. C. Pittman (b)
Houma	H. L. Bourgeois (b)
Lafayette	J. W. Faulk (b)
Lake Charles	Ward Anderson
Minden	J. E. Pitcher (b)
Monroe	E. L. Neville
Morgan City	R. L. Robinson (b)
New Iberia	L. G. Porter (b)
New Orleans	Nicholas Bauer (b)
Opelousas	W. B. Prescott (b)
Plaquemine	L. P. Terrebonne (b)
Shreveport	E. W. Jones (b)
West Monroe	T. O. Brown (b)

Maine

Auburn	G. R. Gardner
Augusta	F. W. Burrill
Bangor	I. W. Small
Bath	John Parker
Belfast	Horatio S. Reed
Biddeford	A. A. Garcelon
Brewer	H. R. Houston
Brunswick	Leon P. Spinney
Calais	Alden Allen
Caribou	G. M. Carter
Gardiner	A. R. Carter
Houlton	Philip H. Woodworth
Lewiston	A. A. Woodworth
Millinocket	W. M. Marr
Oldtown	Joseph A. Leonard
Portland	W. B. Jack
Presque Isle	R. J. Carpenter
Rockland	George J. Cumming
Rumford	L. E. Williams
Saco	Harry C. Hull
Sanford	J. A. Hamlin
Skowhegan	W. B. Woodbury
South Portland	L. C. Day
Waterville	C. E. Glover
Westbrook	Guy Sinclair

Maryland

Annapolis	George Fox (a)
Baltimore	D. E. Weglein
Cambridge	W. Theodore Boston (a)
Cumberland	C. L. Kopp (a)
Frederick	E. W. Pruitt (a)
Frostburg (Address Cumberland)	C. L. Kopp (a)
Hagerstown	B. J. Grimes (a)
Salisbury	J. M. Bennett (a)
Tacoma Park (Address Rockville)	Edwin W. Broome (a)

Massachusetts

Abington	Franklin P. Hawkes
Adams	J. F. Farrell
Agawam	B. J. Phelps
Amesbury	Fred C. English
Amherst	L. L. Dudley
Andover	H. C. Sanborn
Arlington	Joseph S. Keating
Athol	William A. Spooner
Attleboro	L. A. Fales
Auburn	C. M. Harris
Barnstable	R. R. Barr
Belmont	Wm. B. Spalding, Acting
Beverly	Starr M. King
Billerica	E. C. Vining
Boston	Arthur L. Gould
Braintree	C. E. Fisher
Bridgewater	John C. Davis
Brockton	John L. Miller
Brookline	E. R. Caverly
Cambridge	M. E. Fitzgerald
Canton	Richard N. Anketell
Chelmsford	G. S. Wright
Chelsea	Leo P. Casey
Chicopee	J. J. Desmond, Jr.
Clinton	T. F. Gibbons
Concord	H. Paul Larrabee
Danvers	I. G. Smith
Dartmouth	A. R. Paull
Dedham	J. C. Anthony
Dracut	James C. Riley
Easthampton	H. D. Casey
Easton	G. C. Mann
Everett	F. A. Ashley
Fairhaven	C. F. Prior
Fall River	H. L. Belisle
Falmouth	Paul Dillingham
Fitchburg	George C. Francis
Foxborough	Chase McArthur
Framingham	Burr J. Merriam
Franklin	A. W. Hale
Gardner	F. T. Reynolds
Gloucester	E. W. Fellows
Grafton	A. S. Cole
Great Barrington	R. H. Bellows

City	Superintendent
Greenfield	F. W. Porter
Haverhill	A. I. Clow
Hingham	O. K. Collins
Holyoke	W. R. Peck
Hudson	E. J. Harriman
Ipswich	Nathaniel N. Love
Lawrence	Dennis E. Callahan
Leominster	Wm. B. Appleton
Lexington	T. S. Grindle
Lowell	V. M. McCartin
Ludlow	P. R. Baird
Lynn	H. S. Gruver
Malden	F. G. Marshall
Mansfield	Bert L. Merrill
Marblehead	James W. Vose
Marlboro	E. P. Carr
Maynard	J. P. King
Medford	J. S. Kadesch
Melrose	H. H. Stuart
Methuen	L. H. Conant
Middleboro	J. S. Cushing
Milford	A. O. Caswell
Millbury	William D. Shea
Milton	H. F. Turner
Montague	Arthur E. Burke
Natick	C. R. Hall
Needham	Harry A. Brown
New Bedford	A. P. Keith
Newburyport	C. R. Thibadeau
Newton	Julius Warren
North Adams	John F. McGrory
Northampton	William R. Barry
North Andover	F. E. Pitkin
North Attleboro	G. W. Morris
Northbridge	H. J. Phipps
Norwood	Lincoln D. Lynch
Orange	E. C. Hempel
Palmer	C. H. Hobson
Peabody	Wm. A. Welch
Pittsfield	Edward J. Russell
Plymouth	A. B. Handy
Quincy	J. N. Muir
Randolph	A. O. Christiansen
Reading	Arthur E. Pierce
Revere	C. F. Lindstol
Rockland	R. S. Esten
Salem	G. M. Bemis
Saugus	Vernon W. Evans
Shrewsbury	M. A. Sturtevant
Somerset	H. F. Bates
Somerville	E. W. Ireland
Southbridge	Channing H. Greene
South Hadley	Albert T. Patty
Spencer	I. H. Agard
Springfield	John E. Granrud
Stoneham	C. E. Varney
Stoughton	Warren B. Lyman
Swampscott	Frank L. Mansur
Taunton	W. A. Mowry
Tewksbury	S. G. Bean
Uxbridge	A. B. Garcelon
Wakefield	W. B. Atwell
Walpole	A. C. Jones
Waltham	W. H. Slayton
Ware	M. Leroy Greenfield
Wareham	Parker N. Moulton
Watertown	Francis A. Kelly
Webster	J. A. Lobban
Wellesley	Edwin H. Miner
Westboro	J. H. Armstrong
Westfield	C. D. Stiles
West Springfield	J. R. Fausey
Weymouth	P. T. Pearson
Whitman	F. E. Holt
Winchendon	C. A. Mitchell
Winchester	J. J. Quinn
Winthrop	Arthur E. Boudreau
Woburn	Daniel P. Hurld
Worcester	W. S. Young

Michigan

Adrian	George H. Little
Albion	Don Harrington
Alma	F. R. Phillips
Alpena	Russell Wilson
Ann Arbor	O. W. Haisley
Battle Creek	Eldon C. Geyer
Bay City	Ben Klager
Benton Harbor	S. C. Mitchell
Berkeley	R. B. French
Birmingham	Howard Crull
Cadillac	B. C. Shankland
Charlotte	Jay Dykhouse
Coldwater	J. T. Symons
Dearborn	Ray H. Adams
Detroit	Frank Cody
Dowagiac	C. M. Horn
East Detroit	John Kantner
Ecorse	C. J. Miller
Escanaba	John A. Lemmer
Ferndale	E. F. Down
Flint	L. H. Lamb
Gladstone	A. R. Watson
Grand Haven	E. H. Babcock
Grand Rapids	A. W. Krause
Grosse Pointe	E. R. Van Kleeck
Hamtramck	M. A. Kopka
Hancock	O. M. Vedder
Hastings	D. A. Van Buskirk
Highland Park	W. H. Lemmel
Hillsdale	B. L. Davis
Holland	E. E. Fell
Ionia	A. A. Rather
Iron Mountain	John Jelsch
Ironwood	Arthur E. Erickson
Ishpeming	C. L. Phelps
Jackson	Harold Steele
Kalamazoo	Loy Norrix
Kingsford (Address Iron Mountain)	Frank C. Sweeney
Lansing	J. W. Sexton
Lapeer	E. E. Irwin
Lincoln Park	Leo W. Huff
Ludington	H. H. Hawley
Manistee	Dorr L. Wilde
Manistique	A. F. Hall
Marquette	W. M. Whitman
Marshall	H. W. Holmes
Menominee	J. L. Silvernale
Midland	J. J. Schafer
Monroe	George T. Cantrick
Mount Clemens	L. W. Fast
Mount Pleasant	G. E. Ganiard
Muskegon	John A. Craig
Muskegon Heights	W. R. Booker
Negaunee	H. S. Doolittle
Niles	F. W. Crawford
Owosso	E. J. Willman
Petoskey	H. C. Spitler
Pontiac	James H. Harris
Port Huron	Norris A. Hanks
River Rouge	A. McDonald
Roseville	Glenn Schoenhals
Royal Oak	N. J. Quickstad
Saginaw	C. F. Miller
St. Clair Shores	Bruce Calkins
St. Joseph	E. B. Holden
Sault Ste. Marie	G. G. Malcolm
Sturgis	Waldo Adams
Three Rivers	Walter Horst
Traverse City	Glenn E. Loomis
Wyandotte	F. W. Frostic
Ypsilanti	E. H. Chapelle

Minnesota

Albert Lea	H. R. Peterson
Austin	S. T. Neveln
Bemidji	J. W. Smith
Brainerd	G. B. Ferrell
Chisholm	J. P. Vaughan
Cloquet	E. B. Anderson
Columbia Heights	H. C. Nelson
Crookston	L. M. Wikre
Duluth	H. H. Eelkema
Ely	Stanley Adkins
Eveleth	A. D. S. Gillett
Fairmont	John J. Skinner
Faribault	C. Willard Cross
Fergus Falls	L. H. Dominick
Hastings	Roy E. Miller
Hibbing	Sydney A. Patchin
International Falls	J. A. Sathrum
Little Falls	James K. Michie
Mankato	J. E. Anderson
Minneapolis	C. R. Reed
Moorhead	S. G. Reinertsen
New Ulm	H. C. Bauer
Owatonna	Irvin E. Rosa
Red Wing	G. V. Kinney
Rochester	G. H. Sanberg
St. Cloud	H. B. Gough
St. Paul	Paul S. Amidon
South St. Paul	Irvin T. Simley
Stillwater	Guy D. Smith
Virginia	L. A. Lavine
Willmar	A. M. Wisness
Winona	D. F. Dickerson

Mississippi

Biloxi	G. W. Ditto
Brookhaven	Edgar S. Bowlus
Clarksdale	H. B. Heidelberg
Columbus	C. N. Brandon
Corinth	Hal Anderson
Greenville	F. W. Murphy
Greenwood	W. C. Williams
Gulfport	B. Frank Brown
Hattiesburg	W. I. Thames
Jackson	K. P. Walker
Laurel	R. H. Watkins
McComb	D. L. Blackwelder
Meridian	H. M. Ivy
Natchez	W. H. Braden
Tupelo	T. M. Milam
Vicksburg	H. V. Cooper
Yazoo City	R. J. Koonce

Missouri

Boonville	L. E. Ziegler
Brookfield	L. V. Crookshank
Cape Girardeau	L. J. Schultz
Carthage	J. L. Campbell
Chillicothe	H. R. McCall
Clayton	John L. Bracken
Clinton	Arthur Lee
Columbia	W. E. Rosenstengel
De Soto	O. T. Coil
Flat River	Wesley A. Deneke
Fulton	Tom Conrad
Hannibal	E. T. Miller
Independence	W. E. Matthews
Jefferson City	R. T. Scobee
Joplin	E. A. Elliott
Kansas City	George Melcher
Kirksville	J. H. Neville
Kirkwood	F. P. Tillman
Maplewood	G. E. Dille
Marshall	Willard Graff
Maryville	H. S. Thomas
Mexico	L. B. Hawthorne
Moberly	M. F. Beach
Nevada	Jerry J. Vineyard
Poplar Bluff	G. R. Loughead
St. Charles	Stephen Blackhurst
St. Joseph	I. E. Stutsman
St. Louis	Henry J. Gerling
Sedalia	Heber U. Hunt
Sikeston	R. A. Harper
Springfield	Harry P. Study
Trenton	S. M. Rissler
University City	Charles Banks
Warrensburg	Edward Beatty
Washington	C. J. Burger
Webb City	D. R. McDonald
Webster Groves	W. E. Goslin
Wellston	Ernest F. Bush

Montana

Anaconda	W. K. Dwyer
Billings	M. C. Gallagher
Bozeman	D. S. Williams
Butte	Lowell Johnson
Great Falls	Irving W. Smith
Havre	John Shively
Helena	Payne Templeton
Kalispell	W. D. Swetland
Lewistown	C. G. Manning
Livingston	B. A. Winans
Miles City	W. E. Stegner
Missoula	Ira B. Fee

Nebraska

Alliance	H. R. Partridge
Beatrice	E. L. Novotny
Columbus	R. R. McGee
Fairbury	W. E. Scott
Falls City	A. B. Gelwick
Fremont	John G. Hansen
Grand Island	C. Ray Gates
Hastings	A. H. Staley
Kearney	A. E. Burke, Acting
Lincoln	M. C. Lefler
McCook	J. E. Shedd
Nebraska City	Marion R. Schrader
Norfolk	A. P. Burkhardt
North Platte	W. J. Braham
Omaha	Homer W. Anderson
Scottsbluff	M. L. Coleman
York	Earle W. Wiltse

City	Superintendent
Nevada	
Las Vegas	Maude Frazier
Reno	E. Otis Vaughn
New Hampshire	
Berlin	Lloyd P. Young
Claremont	A. B. Kellogg
Concord	Chester A. Moody
Derry	Edward I. Erickson
Dover	Chester L. Howe
Franklin	Fred S. Libbey
Keene	Laurence O. Thompson
Laconia	John S. Gilman
Lebanon	W. J. English
Manchester	Austin J. Gibbons
Nashua	Earle T. Tracey
Portsmouth	Harry L. Moore
Rochester	Arthur S. Rollins
Somersworth	H. L. Winslow
New Jersey	
Asbury Park	Amos E. Kraybill
Atlantic City	Arthur S. Chenoweth
Audubon	William L. Fidler
Bayonne	Preston H. Smith
Belleville	Wayne R. Parmer
Bergenfield	Roy W. Brown
Bloomfield	Edgar S. Stover
Bogota	Grant W. Leman
Boonton	M. Burr Mann
Bound Brook	Albert S. Davis
Bridgeton	Leigh M. Lott
Burlington	Vann H. Smith
Caldwell	Paul H. Axtell
Camden	Leon N. Neulen
Carlstadt	Edward F. Krom
Carteret	Calvin F. Dengler
Cliffside Park	George F. Hall
Clifton	George J. Smith
Collingswood	Carl M. Diefenbach
Cranford	Howard R. Best
Dover	R. S. Bowlby
Dumont	Charles A. Selzer
Dunellen	Ralph W. Crane
East Orange	Henry E. Kentopp
East Rutherford	Alfred S. Faust
Elizabeth	Ira T. Chapman
Englewood	Winton J. White
Fairlawn	F. H. Brunswick
Fairview	Z. G. Masten, Jr.
Fort Lee	J. B. Thompson
Freehold	Lloyd S. Cassel
Garfield	Norman W. Cameron
Glen Ridge	H. W. Dutch
Gloucester	Marvin E. Porch
Guttenburg	Mrs. Anna L. Klein
Hackensack	George A. Merrill
Haddonfield	Everett C. Preston
Haddon Heights	William C. Davis
Hammonton	H. H. Smith
Harrison	John P. Murray
Hasbrouck Heights	C. C. Hitchcock
Hawthorne	F. H. Thoms
Highland Park	F. W. Furth
Hillside	A. G. Woodfield
Hoboken	Daniel S. Kealey
Irvington	Herschel S. Libby
Jersey City	James A. Nugent
Kearny	Edmund L. Tink
Lakewood	Carl M. Bair
Leonia	Nelson C. Smith
Linden	Paul R. Brown
Lodi	Henry V. Matthews
Long Branch	William M. Smith
Lyndhurst	H. P. Shepherd
Madison	Harry A. Wann
Manville	John Zorella
Metuchen	Carl H. Galloway
Millburn twp.	John R. Patterson
Millville	G. Edward McComsey
Montclair	A. L. Threlkeld
Morristown	J. Burton Wiley
Neptune twp.	O. J. Moulton
Newark	Stanley H. Rolfe
New Brunswick	Frederick J. Sickles
Newton	C. H. Reagle
North Arlington	W. R. Holbert
North Bergen	R. W. Madden
North Plainfield	Beekman R. Terhune
Nutley	John A. Spargo
Ocean City	George E. Brown
Orange	W. B. Patrick
Palisades Park	John W. Fuchs
Passaic	Arthur D. Arnold
Paterson	John R. Wilson
Paulsboro	Paul R. Carl
Penns Grove	A. J. Dohner
Pensauken twp.	George B. Fine
Perth Amboy	W. C. McGinniss
Phillipsburg	Clarence V. Sloan
Pitman	Daniel W. Davis
Plainfield	F. W. Cook
Pleasantville	Simon M. Horstick
Princeton	B. Woodhull Davis
Prospect Park (Address Hawthorne)	Edmund H. Viemeister
Rahway	Arthur Perry
Raritan twp. (Address Perth Amboy, R. #1)	Fred A. Talbot
Red Bank	Edwin C. Gilland
Ridgefield Park	A. Ray Palmer
Ridgewood	I. B. Somerville
Roselle	Joseph Bustard
Roselle Park	E. F. Smith
Rutherford	Guy L. Hilleboe
Salem	Halliday R. Jackson
Sayreville	Jesse Selner
Secaucus	M. J. Pechtel
Somerville	T. Latimer Brooks
South Amboy	Oscar O. Barr
South Orange	John H. Bosshart
South Plainfield	Harry C. Fries
South River	Lester A. Rodes
Summit	John B. Dougall
Teaneck	Lester N. Neulen
Tenafly	George A. Kipp
Trenton	Paul Loser
Union City	Albert C. Parker
Union twp.	Charles T. Hassard
Ventnor	Eliz. McNulty (Elementary)
Verona	C. Vincent Geiger
Vineland	Lawrence R. Winchell
Wallington	Joseph F. Moriarty
Weehawken	Kenneth F. Woodbury
Westfield	C. A. Philhower
West New York	Harry L. Bain
West Orange	S. C. Strong
Wildwood	Lanning A. Myers
Woodbridge	V. C. Nicklas
Woodbury	Harry L. Stearns
Woodridge	H. Fremont Donley
New Mexico	
Albuquerque	John Milne
Clovis	J. M. Bickley
Gallup	Chas. L. Rose
Las Cruces	C. S. Conlee
Raton	E. E. Harrison
Roswell	J. D. Shinkle
Santa Fe	R. P. Sweeney
New York	
Albany	Austin R. Coulson
Amsterdam	Heth G. Coons
Auburn	Charles G. Hetherington
Baldwin	Arthur E. Newton
Batavia	Clyde P. Wells
Beacon	E. D. Hewes
Binghamton	Daniel J. Kelly
Bronxville	Frederick H. Bair
Buffalo	Robt. T. Bapst
Canandaigua	W. Howard Vanderhoef
Catskill	J. M. Schnitzer
Cohoes	William S. Schneider
Corning	William E. Severn (Dist. No. 9) Hugh W. Gregg (Dist. No. 13)
Cortland	E. G. Simmons
Depew	George R. Crego
Dobbs Ferry	J. A. McGinness
Dunkirk	F. R. Darling
East Rochester	Theodore L. R. Morgan
Elmira	Oscar F. Kerlin
Elmira Heights	John W. Sahlstrom
Endicott	Herbert H. Crumb
Floral Park	Alvah T. Stanforth
Fredonia	Claude R. Dye
Freeport	John W. Dodd
Fulton	George R. Bodley
Garden City	Frank R. Wassung
Geneva	W. L. Houseman
Glen Cove	H. H. Chapman
Glens Falls	A. W. Miller
Gloversville	H. W. Langworthy
Harrison	L. M. Klein
Hastings-on-Hudson	John L. Hopkins
Haverstraw	Aloysius J. Lynch
Hempstead	William A. Gore
Herkimer	Loraine W. Bills
Hornell	Harrison S. Dodge
Hudson	John T. Kaemmerlen
Hudson Falls	Dana M. King
Huntington	Raymond C. Burdick
Ilion	Earl P. Watkin
Irondequoit	E. W. Nash (Address Rochester)
Ithaca	O. L. Kulp
Jamestown	Clinton V. Bush
Johnson City	H. B. Eccleston
Johnstown	E. L. Ackley
Kenmore	F. C. Densberger
Kingston	B. C. Van Ingen
Lackawanna	Clarence A. Conway
Lancaster	Frank L. Smith
Little Falls	Harold L. Corzett
Lockport	R. B. Kelley
Long Beach	Walter J. Schwalje
Lynbrook	H. Arthur Schubert
Malone	Horace H. Lamberton
Mamaroneck	Arthur Z. Boothby
Massena	Carl V. Warren
Mechanicville	John N. Hayes
Medina	A. E. Trippensee
Middletown	E. H. Burdick
Mineola	Harlan B. Allen
Mount Kisco	H. M. Jennings
Mount Vernon	William H. Holmes
Newark	Edwin R. Woelfel
Newburgh	Snyder J. Gage
New Rochelle	Herold C. Hunt
New York	Harold G. Campbell
Niagara Falls	James F. Taylor
North Tarrytown	Delbert O. Fuller
North Tonawanda	Claude L. Moss
Norwich	Gilbert R. Lyon
Nyack	K. R. MacCalman
Ogdensburg	Arthur J. Laidlaw
Olean	W. C. Greenawalt
Oneida	Albert H. Covell
Oneonta	George J. Dann
Ossining	Harold V. Loomis
Oswego	Frederick Leighton
Oyster Bay	Leon Deming
Patchogue	Sheridan Linn
Peekskill	J. E. Scott
Penn Yan	Clayton E. Rose
Plattsburg	G. M. Elmendorf
Port Chester	Evan E. Jones
Port Jervis	A. H. Naylor
Poughkeepsie	Fox D. Holden
Rensselaer	Walter S. Clark
Rochester	James M. Spinning
Rockville Center	Floyd B. Watson
Rome	George R. Staley
Roslyn	F. R. Wegner
Rye	A. Verne MacCullough
Rye Neck	B. A. Leonard
Salamanca	George A. Place
Saranac Lake	H. V. Littell
Saratoga Springs	Harris Crandall
Scarsdale	Vernon G. Smith
Schenectady	W. H. Pillsbury
Scotia	B. W. Conrad
Seneca Falls	Frank P. Page
Solvay	Clinton H. Atwood
Syracuse	G. Carl Alverson
Tarrytown	J. Leroy Thompson
Tonawanda	Earle F. Wingate
Troy	Neil K. White (Lansingburg Dist.) George H. Krug (Union District)
Tuckahoe	Joseph R. Gardner (Dist. No. 1) John C. Goff (Dist. No. 2)
Tupper Lake	R. E. Minnich
Utica	John A. De Camp
Valley Stream	W. C. Mepham
Watertown	C. E. Sabin
Watervliet	William Richmond
Waverly	A. Verne MacCullough
Wellsville	George F. Jammer
Whitehall	Page E. Cole
White Plains	H. Claude Hardy
Yonkers	Wm. Ward Ankenbrand

City	Superintendent
North Carolina	
Asheboro	Reginald Turner
Asheville	R. H. Latham
Burlington	L. E. Spikes
Canton	A. J. Hutchins
Charlotte	H. P. Harding
Concord	A. S. Webb
Durham	W. F. Warren
Elizabeth City	E. E. Bundy
Fayetteville	Horace Sisk
Gastonia	W. P. Grier
Goldsboro	Ray Armstrong
Greensboro	B. L. Smith
Greenville	I. H. Rose
Henderson	E. M. Rollins (a)
Hendersonville	F. M. Waters
Hickory	R. W. Carver
High Point	C. F. Carroll, Jr.
Kings Mountain	B. N. Barnes
Kinston	W. A. Graham
Lenoir	C. S. Warren
Lexington	L. E. Andrews
Monroe	W. R. Kirkman
Mooresville	H. C. Miller
Morganton	W. F. Starnes
Mount Airy	L. B. Pendergraph
New Bern	H. B. Smith
Raleigh	Claude F. Gaddy
Reidsville	L. J. Perry
Rocky Mount	R. M. Wilson
Salisbury	J. H. Knox
Shelby	W. E. Abernathy
Statesville	R. M. Gray
Tarboro	W. A. Mahler
Thomasville	J. N. Hauss
Washington	E. S. Johnson
Wilmington	H. M. Roland (a)
Wilson	K. R. Curtis (a)
Winston-Salem	J. W. Moore
North Dakota	
Bismarck	H. O. Saxvik
Devils Lake	F. H. Gilliland
Dickinson	A. L. Hagen
Fargo	H. H. Kirk
Grand Forks	Elroy Schroeder
Jamestown	C. L. Robertson
Mandan	J. C. Gould
Minot	L. A. White
Valley City	G. W. Hanna
Williston	J. N. Urness
Ohio	
Akron	Ralph H. Waterhouse
Alliance	B. F. Stanton
Ashland	J. E. Bohn
Ashtabula	M. S. Mitchell
Athens	Harper C. Pendry
Barberton	U. L. Light
Bedford	A. E. Moody
Bellaire	J. V. Nelson
Bellefontaine	S. A. Frampton
Bellevue	W. L. Arnholt
Berea	J. F. Koeppe
Bexley	H. C. Dieterich
Bowling Green	Arch B. Conklin
Bucyrus	D. C. Baer
Cambridge	Hugh R. Hick
Campbell	Andrew S. Klinko
Canton	Jesse H. Mason
Chillicothe	M. M. Berry
Cincinnati	C. V. Courter
Circleville	Frank Fischer
Cleveland	Charles H. Lake
Cleveland Heights	Frank L. Wiley
Columbus	Geo. E. Roudebush
Conneaut	Norman Koontz
Coshocton	A. C. Pence
Cuyahoga Falls	Gilbert Roberts
Dayton	Emerson H. Landis
Defiance	N. G. Fawcett
Delaware	D. R. Smith
Delphos	E. W. Bell
Dover	C. E. Palmer
East Cleveland	W. H. Kirk
East Liverpool	Herbert G. Means
East Palestine	T. R. Hersh
Elyria	R. C. Maston
Euclid	E. C. Grover
Findlay	F. L. Kinley
Fostoria	H. L. Ford
Fremont	U. E. Diener
Galion	O. E. Hill
Gallipolis	E. E. Higgins
Garfield Heights	Harold R. Maurer
Girard	E. O. Trescott
Grandview Heights (Columbus P. O.)	W. C. Rohleder
Greenville	C. L. Bailey
Hamilton	D. R. Baker
Ironton	John A. Miller
Jackson	T. K. Owens
Kent	J. W. Spangler
Kenton	L. E. McKinley
Lakewood	Geo. A. Bowman
Lancaster	Paul Wenger
Lima	J. McLean Reed
Lockland	J. U. Dungan
Logan	G. E. Carr
Lorain	P. C. Bunn
Mansfield	W. L. Miller
Maple Heights (Bedford P. O.)	O. E. Hadfield
Marietta	H. L. Sullivan
Marion	C. A. Hudson
Martins Ferry	F. L. Teal
Massillon	L. J. Smith
Miamisburg	Harris V. Bear
Middletown	R. W. Solomon
Mingo Junction	M. L. Dennis
Mount Vernon	A. W. Elliott
Nelsonville	E. J. Arnold
Newark	Paul B. Edwards
New Boston	D. E. Ross
New Philadelphia	H. S. Carroll
Niles	S. J. Bonham
Norwalk	H. C. Ellis
Norwood	Harold S. Bates
Oakwood (Dayton P. O.)	A. E. Claggett
Painesville	C. C. Pierce
Parma	F. S. Shields
Piqua	G. C. Dietrich
Portsmouth	Frank Appel
Ravenna	C. R. Dustin
Reading	H. L. Bussey
Rocky River	J. J. Young
St. Bernard	W. E. Melvin
St. Marys	C. C. McBroom
Salem	E. S. Kerr
Sandusky	F. J. Prout
Shaker Heights	Arthur K. Loomis
Shelby	C. G. Keck
Sidney	C. C. Crawford
Springfield	H. L. Stevens
Steubenville	Russell H. Erwine
Struthers	H. E. Zuber
Tiffin	Paul V. Brown
Toledo	E. L. Bowsher
Toronto	S. C. Dennis
Troy	T. E. Hook
Uhrichsville	H. B. Galbraith
Urbana	R. M. Fosnight
Van Wert	C. D. Fox
Wadsworth	Frank H. Close
Wapakoneta	M. R. Menschel
Warren	H. B. Turner
Washington Court House	L. W. Reese
Wellston	H. L. Holter
Wellsville	S. E. Daw
Wilmington	H. W. Hodson
Wooster	C. M. Layton
Xenia	R. J. Warner
Youngstown	Pliny H. Powers
Zanesville	Kenneth C. Ray
Oklahoma	
Ada	C. D. Procter
Altus	A. G. Steele
Alva	H. L. Hensley
Anadarko	R. L. McLean
Ardmore	George D. Hann
Bartlesville	H. E. Wrinkle
Blackwell	Harry Hutson
Bristow	E. H. Black
Chickasha	T. T. Montgomery
Clinton	Arnett Cross
Cushing	W. B. French
Duncan	N. L. George
Durant	G. T. Stubbs
Elk City	A. M. Keeth
El Reno	Paul R. Taylor
Enid	DeWitt Waller
Guthrie	W. A. Greene
Henryetta	E. E. Battles
Holdenville	D. D. Kirkland
Hugo	Harvey M. Black
Lawton	B. C. Swinney
McAlester	Verl A. Teeter
Miami	R. C. Nichols
Muskogee	J. R. Holmes
Norman	J. Don Garrison
Oklahoma City	C. K. Reiff
Okmulgee	W. Max Chambers
Pawhuska	Ross C. Kendall
Picher	W. W. Schultze
Ponca City	C. P. Howell
Sand Springs	Clyde H. Odell
Sapulpa	E. O. Shaw
Seminole	John G. Mitchell
Shawnee	A. L. Burks
Stillwater	E. D. Price
Tulsa	H. W. Gowans
Wewoka	Harry D. Simmons
Woodward	R. R. Russell
Oregon	
Albany	Frank B. Bennett
Astoria	A. C. Hampton
Baker	A. E. Hirschler
Bend	R. E. McCormack
Corvallis	J. F. Schenk
Eugene	J. F. Cramer
Klamath Falls	J. P. Wells
La Grande	A. L. Gralapp
Marshfield	Lynn A. Parr
Medford	E. H. Hedrick
Oregon City	J. T. Longfellow
Pendleton	Austin Landreth
Portland	R. E. Dugdale
Salem	Silas Gaiser
The Dalles	Paul R. McCulloch
Pennsylvania	
Abington	Joseph C. Weirick
Aliquippa	Lytle M. Wilson
Allentown	Wm. L. Connor
Altoona	Levi Gilbert
Ambridge	J. R. Miller
Archbald	John F. Moran
Arnold	H. L. Holste
Ashland	Joseph Davison
Ashley	Robert C. Metz
Avalon	S. Todd Perley
Bangor	Harry O. Eisenberg
Beaver	G. A. McCormick
Beaver Falls	J. Roy Jackson
Bellevue	Harry E. Brumbaugh
Bensalem twp. (Address Cornwells Heights)	Samuel K. Faust
Berwick	M. E. Houck
Bethlehem	William Howard Weirs
Blairsville	N. Montgomery (c)
Blakely Boro. (Address Peckville)	H. B. Anthony
Bloomsburg	L. P. Gilmore (c)
Brackenridge	R. R. Anderson (c)
Braddock	W. O. Evans
Bradford	Floyd C. Fretz
Brentwood	J. D. Boydston (c)
Bridgeport	C. C. Smith
Bristol	Warren P. Snyder
Butler	Roy W. Wiley
Canonsburg	Clinton A. Mathewson
Carbondale	Mary B. McAndrew
Carlisle	J. W. Potter
Carnegie	Norman L. Glasser
Cecil twp. (Address Canonsburg)	H. S. Kuder
Centerville (Address West Brownsville)	C. H. Lyon (c)
Chambersburg	U. L. Gordy
Charleroi	T. L. Pollock
Cheltenham twp. (Address Elkins Park)	Frank C. Ketler
Chester	F. Herman Fritz
Clairton	H. D. Teal
Clearfield	S. F. W. Morrison
Clifton Heights	Chas. A. Brinton (c)
Coaldale	John E. Gildea (c)
Coal twp. (Address Shamokin)	P. F. Brennan
Coatesville	Carl O. Benner
Collingdale	F. E. Stengle
Columbia	J. B. Kennedy
Connellsville	William G. Davis

City	Superintendent
Conshohocken	Robert C. Landis
Coraopolis	G. W. Cassler (c)
Corry	Ralph S. Dewey
Crafton	Denton M. Albright
Danville	E. B. Kline (c)
Darby	W. R. Douthett
Derry twp. (Address Hershey)	J. I. Baugher
Dickson City Boro.	P. M. Brennan
Donora	John E. Shambach
Dormont	David H. Stewart
Du Bois	Herbert E. Reisgen
Dunbar twp. (Address Leisenring)	W. E. Tiethohl
Dunmore	J. R. Gilligan
Dupont	C. T. Dugan (c)
Duquesne	Fred C. Gillespie
Duryea	J. J. Joyce (c)
Easton	James C. Bay
East Pittsburgh	Charles F. Young
Edwardsville	V. E. Lewis (c)
Ellwood City	J. Ellis Bell
Emaus	H. J. Yeager
Erie	C. Herman Grose
Etna	Clayton L. McMillen
Exeter	John B. Campbell
Farrell	W. W. Irwin
Fell twp. (Address Carbondale)	John H. Campbell
Ford City	Quincey G. Vincent
Forest City	Jules J. Kerl
Forty Fort	Frank W. Ways (c)
Frackville	Wm. R. Trautman (c)
Franklin	Karl M. Russell
Freeland	N. P. Luckenbill (c)
German twp. (Address McClellandtown)	J. Carman Newcomer
Gettysburg	L. C. Keefauver
Glassport	M. S. Naser (c)
Greensburg	Wm. H. McIlhattan
Greenville	A. Bruce Denniston
Grove City	H. M. B. Lehn
Hanover	Robert A. Bagshaw
Harrisburg	R. R. Abernethy
Haverford twp. (Address Upper Darby)	J. Frank Carter
Hazle twp. (Address Freeland, R. D. #1)	Joseph D. Gallagher
Hazleton	A. D. Thomas
Hollidaysburg	Hobson C. Wagner
Homestead	Port Eckles
Honesdale	J. H. Koehler
Huntingdon	J. G. Everard
Indiana	E. C. Perry
Jeannette	Foster B. Snowden
Jersey Shore	Charles W. Potter (c)
Johnsonburg	G. E. Engstrom (c)
Johnstown	Dale D. McMaster
Kane	Glennis H. Rickert
Kingston	Bela B. Smith
Kittanning	Clyde W. Cranmer
Kulpmont	J. A. Shovlin (c)
Lancaster	Harvey A. Smith
Lansdale	Ralph R. Smith
Lansdowne	S. N. Ewan, Jr.
Lansford	John E. Lauer
Latrobe	John G. Hulton
Lebanon	John W. Hedge
Lehighton	Bert B. David
Lewistown	C. V. Erdly
Lock Haven	J. F. Puderbaugh
Lower Merion twp. (Address Ardmore)	S. Edgar Downs
Luzerne	T. Stuart Williams (c)
Mahanoy City	H. S. Bolan
Mahanoy twp. (Address Mahanoy City)	Jas. P. Noonan
Mauch Chunk twp. (Address Nesquehoning)	Clayton W. Wotring
McAdoo	Sallie L. Ferry (c)
McKeesport	C. H. Pelted
McKees Rocks	W. H. Church
Meadville	Warren P. Norton
Mechanicsburg	E. B. Long
Media	Wm. H. Michaels (c)
Middletown	G. W. Feaser
Midland	W. S. Bazard
Millvale	V. C. Holsinger (c)
Milton	Carl L. Millward
Minersville	C. E. Roudabush
Monessen	A. John Goetz
Monongahela	John H. Dorr
Morrisville	M. R. Reiter (c)
Mount Carmel	G. A. Beierschmitt
Mt. Carmel twp. (Address Locust Gap)	P. J. Burke
Mount Lebanon	H. V. Herlinger
Mount Oliver	A. D. Cleland (c)
Mount Pleasant	J. C. Haberlen
Mount Pleasant twp. (Address Mt. Pleasant)	Lloyd F. Rumbaugh
Muhlenberg twp. (Address Temple)	C. E. Cole
Munhall	Earle O. Liggitt
Nanticoke	A. P. Diffendafer
Nanty-Glo	C. H. Bowers
Nazareth	F. A. Marcks
New Brighton	S. W. Lyons
New Castle	Clyde C. Green
New Kensington	E. T. Chapman
Newport twp. (Address Alden Station)	Andrew E. Rushin
Norristown	H. O. Dietrich
Northampton	G. A. Eichler
North Braddock	F. D. Zuerner
North Huntingdon twp. (Address Irwin)	Carl C. Pearsall
Oakmont	W. Lee Gilmore
Oil City	Vaughn R. DeLong
Old Forge	B. T. Harris
Olyphant	John A. Dempsey
Palmerton	J. N. Roeder
Philadelphia	A. J. Stoddard
Phoenixville	Martin L. Peters
Pitcairn	R. L. Roose (c)
Pittsburgh	Ben G. Graham
Pittston	Elizabeth Battle (c)
Plains	M. V. Hughes (c)
Plymouth	H. S. Jones
Pottstown	Frank Haiston
Pottsville	M. R. McGovern
Punxsutawney	James T. Downie
Radnor twp. (Address Wayne)	Sydney V. Rowland
Rankin	Dennis J. Sullivan
Reading	Thomas Henry Ford
Ridgway	A. C. Nelson
Rochester	Robert P. Barner
Rostraver twp. (Address Belle Vernon, R.D. #1)	Ernest Frank Carter
St. Clair	Charles R. Birch
St. Marys	L. T. Kelly (c)
Sayre	L. E. DeLaney
Schuylkill Haven	Paul S. Christman (c)
Scottdale	S. B. Bulick
Scranton	John H. Dyer
Sewickley	L. H. Conway (c)
Shamokin	P. E. Whitmeyer
Sharon	W. D. Gamble
Sharpsburg	J. J. Donovan (c)
Sharpsville	Harry E. Pebly (c)
Shenandoah	A. J. Ratchford
South Williamsport	A. B. Elder (c)
Springfield twp. (Address Chestnut Hill)	A. L. Gehman
Steelton	Orris H. Aurand
Stroudsburg	Robert Brown
Summit Hill	E. T. McCready
Sunbury	Ira S. Brinser
Swissvale	C. S. Baily
Swoyersville	Henry R. Horvat (c)
Tamaqua	F. G. Horner
Tarentum	A. D. Endsley
Taylor	W. J. Powell
Throop	John J. O'Hara
Titusville	John H. Linton
Tredyffrin twp. (Address Berwyn)	Wilmer K. Groff
Turtle Creek	W. W. Lantz (c)
Tyrone	W. W. Eisenhart
Uniontown	J. N. Mowls
Upper Darby	William C. Sampson
Upper Merion twp. (Address Bridgeport)	Warren A. Cocklin (c)
Vandergrift	John R. Kurtz
Warren	J. G. Rossman
Washington	Meyers B. Horner
Waynesboro	Walter C. Richter
West Chester	G. Arthur Stetson
West Deer twp. (Address Russellton)	Berger Franklin Edlund
West Hazleton	August Martin (c)
West Mahanoy twp. (Address Lost Creek)	Henry F. Murray
West Pittston	R. J. W. Templin
West View	M. J. Horsch (c)
West York	A. H. Martin (c)
Whitehall twp. (Address Egypt)	Clarence M. Cockley
Wilkes-Barre	A. E. Bacon
Wilkinsburg	W. C. Graham
Williamsport	A. M. Weaver
Wilmerding	N. I. Reist (c)
Wilson Boro. (Address Easton)	C. E. Furst
Windber	Joseph L. Hackenberg
Winton Boro. (Address Jessup)	J. L. McCloskey
Yeadon	R. H. Koch
York	A. W. Ferguson

Rhode Island

Barrington	Charles H. Keyes
Bristol	E. S. Mapes
Burrillville	J. C. Sweeney
Central Falls	James E. Martin
Coventry	R. E. E. Campbell
Cranston	C. W. Bosworth
Cumberland	Bernard F. Norton
East Providence	J. R. D. Oldham
Johnston	Aaron F. DeMoranville
Lincoln	John L. Smith
Newport	Harold T. Lowe
North Providence	James L. McGuire
Pawtucket	Frank A. R. Allen
Providence	James L. Hanley
South Kingstown	E. K. Wilcox
Warren	Leroy G. Staples
Warwick	Warren A. Sherman
Westerly	Willard H. Bacon
West Warwick	John F. Deering
Woonsocket	Leon F. Farrin

South Carolina

Aiken	L. K. Hagood
Anderson	E. C. McCants
Camden	J. G. Richards, Jr.
Charleston	A. B. Rhett
Chester	Myron E. Brockman
Clinton	W. E. Monts
Columbia	A. C. Flora
Darlington	J. C. Daniel
Florence	John W. Moore
Gaffney	L. F. Carson
Georgetown	W. C. Bynum
Greenville	J. L. Mann
Greenwood	W. E. Black
Hartsville	J. H. Thornwell
Laurens	C. K. Wright
Newberry	O. B. Cannon
Orangeburg	A. J. Thackson
Rock Hill	W. C. Sullivan
Spartanburg	L. W. Jenkins
Sumter	W. H. Shaw
Union	T. C. Jolly, Jr.

South Dakota

Aberdeen	C. L. Dalthorp
Huron	Andrew J. Lang
Lead	R. V. Hunkins
Mitchell	John C. Lindsey
Rapid City	E. B. Bergquist
Sioux Falls	W. I. Early
Watertown	H. Mackenzie
Yankton	C. A. Beaver

Tennessee

Alcoa	V. F. Goddard
Athens	J. C. Ridenour
Bristol	J. H. Arrants
Chattanooga	W. T. Robinson
Clarksville	C. H. Moore
Cleveland	R. T. Allen
Columbia	W. J. Fields
Dyersburg	C. M. Walker

City	Superintendent
Elizabethton	E. L. Bowers
Greeneville	Mac Alexander
Jackson	C. B. Ijams
Johnson City	C. E. Rogers
Kingsport	R. N. Robinson
Knoxville	Harry Clark
Memphis	Ernest Ball
Morristown	Carl T. Vance
Murfreesboro	J. C. Mitchell
Nashville	W. A. Bass
Paris	W. O. Inman
Shelbyville	Troy G. Young
Springfield	W. M. Overcash
Union City	T. D. Ozment
Texas	
Abilene	L. E. Dudley
Amarillo	C. M. Rogers
Austin	A. N. McCallum
Beaumont	E. W. Jackson
Big Spring	W. C. Blankenship
Bonham	J. B. Carruth
Borger	W. A. McIntosh
Breckenridge	N. S. Holland
Brenham	C. M. Selman
Brownsville	E. C. Dodd
Brownwood	E. J. Woodward
Bryan	W. D. Wilkerson
Childress	Chas. E. Damron
Cisco	R. N. Cluck
Cleburne	Emmett Brown
Coleman	C. H. Hufford
Corpus Christi	R. B. Fisher
Corsicana	W. H. Norwood
Crystal City	S. H. Fly
Dallas	N. R. Crozier
Del Rio	Drury Wood
Denison	B. M. McDaniel
Denton	R. C. Patterson
Eagle Pass	F. R. Thompson
Electra	B. M. Dinsmore
El Paso	A. H. Hughey
Ennis	W. F. Howard
Fort Worth	W. M. Green
Gainesville	H. O. McCain
Galveston	S. B. Graham
Goose Creek	Harmon Lowman
Greenville	H. H. Chambers
Harlingen	E. C. Deering
Highland Park	H. E. Gable
Hillsboro	Loy W. Hartsfield
Houston	E. E. Oberholtzer
Huntsville	R. M. Hawkins
Jacksonville	Larue Cox
Kingsville	C. E. Wade
Laredo	W. P. Galligan
Longview	Henry L. Foster
Lubbock	W. B. Irvin
Lufkin	I. A. Coston
Luling	R. A. Box
Marlin	H. J. McIlhany
Marshall	Bryan Dickson
McAllen	John H. Gregory
McKinney	Jack R. Ryan
Mercedes	Ernest H. Poteet
Mexia	Frank L. Williams
Midland	W. W. Lackey
Mineral Wells	W. A. Ross
Mission	H. C. Proctor
Nacogdoches	Rufus E. Price
Navasota	J. T. Ferguson
New Braunfels	E. A. Sahm
Orange	W. E. Lowry
Palestine	Bonner Frizzell
Pampa	L. L. Sone
Paris	A. H. Chamness
Plainview	O. J. Laas
Port Arthur	G. M. Sims
Ranger	W. T. Walton
San Angelo	Felix E. Smith
San Antonio	I. E. Stutsman
San Benito	O. L. Davis
San Marcos	Fred Kaderli
Seguin	Joe F. Saegert
Sherman	R. L. Speer
Sour Lake	J. L. Johnson
Sulphur Springs	W. L. Willis
Sweetwater	R. S. Covey
Taylor	E. T. Robbins
Temple	L. C. Procter
Terrell	J. E. Langwith
Texarkana	H. W. Stilwell
Tyler	J. M. Hodges
Uvalde	Guy D. Dean
Vernon	C. H. Dillehay
Victoria	P. S. Garner
Waco	R. H. Brister
Waxahachie	T. C. Wilemon
Wichita Falls	H. D. Fillers
Yoakum	G. P. Barron
Utah	
Brigham	Hervin Bunderson (a)
Logan	E. Allen Bateman
Murray	James Clove
Ogden	W. Karl Hopkins
Provo	J. C. Moffitt
Salt Lake City	L. John Nuttall, Jr.
Tooele	P. M. Nielsen (a)
Vermont	
Barre	Wm. H. Carter
Bennington	H. D. Sylvester
Brattleboro	Florence M. Wellman
Burlington	Lyman C. Hunt
Montpelier	W. A. Kincaid
Newport	E. A. Hamilton
Rockingham	Natt B. Burbank
Rutland	W. W. Fairchild
St. Albans	Josiah S. McCann
St. Johnsbury	Frank R. Adams
Springfield	Ernest G. Ham
Winooski	G. R. Stackpole
Virginia	
Alexandria	T. C. Williams
Bristol	B. D. French
Charlottesville	James G. Johnson
Clifton Forge	Herman Blankinship
Covington	A. L. Bennett (a)
Danville	G. L. H. Johnson
Fredericksburg	G. H. Brown
Hampton	Robert M. Newton (a)
Harrisonburg	W. H. Keister
Hopewell	R. W. Copeland (a)
Lynchburg	Omer Carmichael
Martinsville	E. E. Givens
Newport News	J. H. Saunders
Norfolk	C. W. Mason
Petersburg	Henry G. Ellis
Portsmouth	Harry A. Hunt
Pulaski	H. H. Bruce (a)
Radford	A. K. Eagle
Richmond	J. H. Binford
Roanoke	D. E. McQuilkin
South Norfolk	R. H. Pride
Staunton	L. F. Shelburne
Suffolk	John E. Martin
Waynesboro	R. C. Jennings
Winchester	G. R. Quarles
Washington	
Aberdeen	Edward F. Bloom
Anacortes	De Fore Cramblitt
Bellingham	C. Paine Shangle
Bremerton	Tillman Peterson
Centralia	Paul F. Ferguson
Everett	R. E. Cook
Hoquiam	H. C. Crumpacker
Kelso	C. H. Lillie
Longview	E. J. McNamara
Olympia	L. P. Brown
Port Angeles	F. W. Breakey
Puyallup	P. B. Hanawalt
Seattle	Worth McClure
Spokane	O. C. Pratt
Tacoma	Howard R. Goold
Vancouver	Paul Gaiser
Walla Walla	W. A. Lacey
Wenatchee	W. B. Smith
Yakima	A. C. Davis
West Virginia	
Beckley	E. Van Dorsey (a)
Bluefield (Address Princeton)	C. H. Archer (a)
Charleston	Virgil Flinn (a)
Clarksburg	Stanley C. Butler
Elkins	Bryan Hamilton (a)
Fairmont	J. J. Straight (a)
Grafton	E. G. Kuhn (a)
Hinton	Margaret Nicely (a)
Huntington	O. C. Nutter (a)
Keyser	Paul C. Rouzer (a)
Martinsburg	G. Wm. Ropp (a)
Morgantown	Floyd B. Cox (a)
Moundsville	Louis R. Potts (a)
Parkersburg	John A. Davis, Jr. (a)
Princeton	C. H. Archer (a)
Richwood	L. O. Bobbitt (a)
South Charleston (Address Charleston)	Virgil Flinn (a)
Welch	George W. Bryson (a)
Wellsburg	Olen Rutan (a)
Weston	Robert T. Crawford (a)
Wheeling	J. P. McHenry (a)
Williamson	C. O. Batson (a)
Wisconsin	
Antigo	P. A. Tipler
Appleton	Ben J. Rohan
Ashland	George A. Bassford
Baraboo	Gordon L. Willson
Beaver Dam	A. H. Luedke
Beloit	V. F. Dawald, Acting
Chippewa Falls	Robert F. Lohrie
Cudahy	J. R. Brandsmark
De Pere	T. J. McGlynn
Eau Claire	Alvin T. Stolen
Fond du Lac	L. P. Goodrich
Fort Atkinson	Frank C. Bray
Green Bay	G. E. Denman
Janesville	V. E. Klontz
Kaukauna	J. F. Cavanaugh
Kenosha	G. F. Loomis
La Crosse	G. M. Wiley
Madison	R. W. Bardwell
Manitowoc	Hugh S. Bonar
Marinette	G. E. Watson
Marshfield	E. L. Giroulx
Menasha	F. B. Younger
Menomonie	W. G. Ballentine
Merrill	George F. Brooks
Milwaukee	M. C. Potter
Monroe	E. O. Evans
Neenah	C. F. Hedges
Oconto	L. W. Fulton
Oshkosh	Charles C. Bishop
Portage	A. J. Henkel
Racine	Wm. C. Giese
Rhinelander	W. F. Kruschke
Rice Lake	W. F. Waterpool
Sheboygan	H. E. Smith
Shorewood	H. S. Hemenway
South Milwaukee	John P. Mann
Stevens Point	P. M. Vincent
Superior	W. R. Davies
Two Rivers	Fred G. Bishop
Watertown	R. A. Buell
Waukesha	R. F. Lewis
Waupun	H. C. Wegner
Wausau	E. C. Hirsch
Wauwatosa	W. T. Darling
West Allis	H. B. Nash
Whitefish Bay (Address Milwaukee)	C. L. Mulrine
Wisconsin Rapids	Floyd Smith
Wyoming	
Casper	Dean Morgan
Cheyenne	J. L. Goins
Laramie	A. A. Slade
Rock Springs	E. M. Thompson
Sheridan	J. J. Early

References

(a) County superintendent. (b) Parish superintendent. (c) Supervising principal.

SECTION XVII
SUPERINTENDENTS OF CATHOLIC PAROCHIAL SCHOOLS

In the following list the names of the archdioceses and dioceses appear in capitals at the left margin. Archdioceses are asterisked.

DIOCESAN SUPERINTENDENTS OF SCHOOLS

Alabama

MOBILE—Rt. Rev. L. J. Carroll, Superintendent of Parochial Schools, 400 Government Street, Mobile, Ala.

Arizona

TUCSON—Rev. Willard A. Kinney, Secretary and Chancellor, 192 South Stove Avenue, Tucson, Ariz.

Arkansas

LITTLE ROCK—Very Rev. Msgr. John J. Healy, Diocesan Superintendent of Schools, Little Rock College, Little Rock, Ark.

California

LOS ANGELES *—Rev. Wm. E. North, Ph.D., Diocesan Superintendent of Schools, 714 West Olympic Boulevard, Los Angeles, Calif.

SAN FRANCISCO *—Rev. James H. Long, Diocesan Superintendent of Schools, 50 Oak Street, San Francisco, Calif.

MONTEREY and FRESNO—Rev. James Dowling, M.A., Diocesan Superintendent of Schools, 2820 Mariposa Street, Fresno, Calif.

SACRAMENTO—Rev. Raymond Renwald, Diocesan Superintendent of Schools, Box 1706, Sacramento, Calif.

SAN DIEGO—Rev. Michael J. O'Connor, Diocesan Superintendent of Schools, 1528 Fourth Avenue, San Diego, Calif.

Colorado

DENVER—Rev. M. Hubert Newell, Diocesan Superintendent of Schools, 230 East 17th Avenue, Denver, Colo.

Connecticut

HARTFORD—Rev. Austin Munich, Diocesan Supervisor of Schools, St. Thomas Seminary, Bloomfield, Conn.

Delaware

WILMINGTON—Rev. Leo W. O'Neill, Diocesan Superintendent of Schools, 809 South Broom Street, Wilmington, Del.

Florida

ST. AUGUSTINE—Rt. Rev. P. J. McGill, Chancellor, St. Augustine's Cathedral, St. Augustine, Fla.

Georgia

SAVANNAH-ATLANTA—Rev. T. James McNamara, Diocesan Superintendent of Schools, P. O. Box 304 Milledgeville, Ga.

Idaho

BOISE—Rev. J. P. O'Toole, Diocesan Director of Schools, 412 State Street. Boise, Idaho.

Illinois

CHICAGO *—Very Rev. Msgr. D. F. Cunningham, M.A., LL.D., Diocesan Superintendent of Schools, 755 North State Street, Chicago, Ill.

BELLEVILLE—Very Rev. Msgr. John J. Fallon, M.A., Diocesan Superintendent of Schools, 63d and West Main Streets, Belleville, Ill.

PEORIA—Rev. M. J. Haddigan, Diocesan Superintendent of Schools, 405 Smith Street, Peoria, Ill.

ROCKFORD—Rev. William J. Donovan, Diocesan Superintendent of Schools, 95 East Wilson Street, Batavia, Ill.

SPRINGFIELD—Rev. George M. Link, Director of Education, 524 East Lawrence Avenue, Springfield, Ill.

Indiana

FORT WAYNE—Rev. Thomas E. Dillon, Superintendent of Catholic Schools, 903 North Jefferson Street, Huntington, Ind.

INDIANAPOLIS—Rev. Leonard Wernsing, Diocesan Superintendent of Schools, 144 West Georgia Street, Indianapolis, Ind.

Iowa

DUBUQUE *—Rt. Rev. Msgr. John M. Wolfe, Diocesan Superintendent of Schools, 11th and Bluff Streets, Dubuque, Ia.

DAVENPORT—Rev. Richard Egan, Diocesan Superintendent of Schools, 901 Kahl Building, Davenport, Iowa.

DES MOINES—Rev. L. V. Lyons, Diocesan Superintendent of Schools, St. Ambrose Cathedral, Des Moines, Iowa.

SIOUX CITY—Rev. C. Ivis, Diocesan Superintendent of Schools, St. Anthony's Home, Sioux City, Iowa.

Kansas

CONCORDIA—Rev. Michael J. Hogan, Diocesan Superintendent of Schools, St. Mary's Hospital, Manhattan, Kans.

LEAVENWORTH—Rev. William T. C. Boland, Secretary of the School Board, 204 West 8th Street, Topeka, Kan.

WICHITA—Rev. Leon A. McNeill, Diocesan Superintendent of Education, 307 East Central Avenue, Wichita, Kans.

Kentucky

LOUISVILLE *—Rev. Felix Pitt, Ph.D., Secretary of Louisville Catholic School Board, 443 South Fifth Street, Louisville, Ky.

COVINGTON—Rev. Joseph H. Whalen, Secretary Diocesan School Board, 1011 Main Street, Paris, Ky.

OWENSBORO—Rev. Gilbert Henninger, Chancery Office, 609 East 4th Street, Owensboro, Ky.

Louisiana

NEW ORLEANS *—Rev. Edward C. J. Prendergast, Superintendent of Catholic Schools, 7845 Apricot Street, New Orleans, La.

ALEXANDRIA—Rev. J. E. Howard, Chancellor, 1805 Jackson Avenue, Alexandria, La.

LAFAYETTE—Rt. Rev. Msgr. Anthony F. Isenberg, Diocesan Superintendent of Schools, The Cathedral, Lafayette, La.

Maine

PORTLAND—Rev. John J. Barrett, Diocesan Superintendent of Schools, 307 Congress Street, Portland, Maine.

Maryland

BALTIMORE *—Rev. John I. Barrett, Ph.D., J.C.L., Diocesan Superintendent of Schools, 415 Cathedral Street, Baltimore, Md.

Massachusetts

BOSTON *—Rev. Richard Quinlan, S.T.L., Diocesan Superintendent of Schools, 75 Union Park Street, Boston, Mass.

FALL RIVER—Rev. Edward J. Gorman, M.A., Superintendent of Diocesan Schools, 162 Walnut Street, Fall River, Mass.

SPRINGFIELD—Rev. Dr. John R. Rooney, Diocesan Superintendent of Schools, College of Our Lady of the Elms, Chicopee Falls, Mass.

Michigan

DETROIT *—Rev. Carroll F. Deady, Ph.D., Diocesan Superintendent of Schools, 1234 Washington Boulevard, Detroit, Mich.

GRAND RAPIDS—Rev. E. L. Quaderer, Diocesan Superintendent of Schools, 385 Leonard Street, N. E., Grand Rapids, Mich.

LANSING—Rev. Joseph R. Byrne, Secretary, 233 Seymour Avenue, Lansing, Mich.

MARQUETTE—Rev. Martin Melican, Superintendent of Parochial Schools, Holy Family Orphan's Home, Marquette, Mich.

SAGINAW—Rev. John J. Sonefeld, Chancellor, 124 North Hamilton Street, Saginaw, Mich.

Minnesota

ST. PAUL *—Rev. Roger J. Connole, Ph.D., Diocesan Superintendent of Schools, 240 Summit Avenue, St. Paul, Minn.

CROOKSTON—Rev. Victor Miller, Diocesan Superintendent of Schools, St. Joseph's Church, Ada, Minn.

DULUTH—Rev. John Sholar, Ph.D., Superintendent of Catholic Schools, 610 99th Avenue W., Duluth, Minn.

ST. CLOUD—Rev. T. Leo Keaveny, Ph.D., Diocesan Superintendent of Schools, Cathedral Rectory, 316 Seventh Avenue N., St. Cloud, Minn.

WINONA—Rev. R. W. Bartholome, Diocesan Director of Confraternity of Christian Doctrine, St. Mary's Hospital, Rochester, Minn.

Mississippi

NATCHEZ—Rev. D. J. O'Beirne, Chancellor, Bishop's House, 107 South Union Street, Natchez, Miss.

Missouri

ST. LOUIS—Very Rev. James P. Murray, Superintendent of Parish Schools, 2709 Clara Avenue, St. Louis, Mo.

KANSAS CITY—Rev. John J. Murphy, Diocesan Superintendent of Schools, 1310 Westport Road, Kansas City, Mo.

ST. JOSEPH—Rev. Joseph W. Helmes, Ph.D., Director of Charities, 519 10th Street, St. Joseph, Mo.

Montana

GREAT FALLS—Rev. John E. Regan, Chancellor, 1611 2nd Avenue North, Great Falls, Mont.

HELENA—Rev. J. A. Rooney, M.A., S.T.L., Diocesan Superintendent of Schools, 1306 North Main Street, Walkerville, Mont.

Nebraska

GRAND ISLAND—Rev. Bernard Galvin, Diocesan Superintendent of Schools, St. Michael's Church, Spalding, Nebr.

LINCOLN—Very Rev. Msgr. L. V. Barnes, B.A., Diocesan Superintendent of Schools, 514 South 18th Street, Lincoln, Nebr.

OMAHA—Rev. Joseph H. Ostdiek, Diocesan Superintendent of Schools, 2507 Cass Street, Omaha, Nebr.

Nevada

RENO—Very Rev. Robert J. Harrigan, Chancellor and Secretary, P. O. Box 1050, Reno, Nev.

New Hampshire

MANCHESTER—Rev. William P. Clancy, D.D., Diocesan Superintendent of Schools, Mt. St. Mary's Academy, Hooksett, N. H.

New Jersey

NEWARK *—Very Rev. Msgr. Wm. F. Lawlor, LL.D., Diocesan Superintendent of Schools, 31 Mulberry Street, Newark, N. J.

CAMDEN—Rev. Wm. J. Hickey, Diocesan Superintendent of Schools, 10 North Myrtle Street, Vineland, N. J.

PATERSON—Rev. Walter H. Hill, Diocesan Superintendent of Schools, 24 De Grasse Street, Paterson, N. J.

TRENTON—Rev. Richard T. Crean, 155 North Warren Street, Trenton, N. J.

New Mexico

SANTA FE *—Rt. Rev. Msgr. A. Estvelt, P.A., V.C., Socorro, N. Mex.

New York

NEW YORK *—Rev. William R. Kelly, M.A., Diocesan Superintendent of Schools, 23 East 51st Street., New York, N. Y.

ALBANY—Rev. James P. Hanrahan, M.A., Superintendent of Parish Schools, 695 Fifth Avenue, Watervliet, N. Y.

BROOKLYN—Rt. Rev. Msgr. Joseph V. S. McClancy, Diocesan Superintendent of Schools, 75 Greene Avenue, Brooklyn, N. Y.

BUFFALO—Rev. John W. Peel, Superintendent of Parochial Schools, 793 Elk Street, Buffalo, N. Y.

OGDENSBURG—Rt. Rev. Msgr. John M. Hogan, Diocesan Superintendent of Schools, 218 Hamilton Street, Ogdensburg, N. Y.

ROCHESTER—Rev. John M. Duffy, Diocesan Superintendent of Schools, 50 Chestnut Street, Rochester, N. Y.

SYRACUSE—Rev. David C. Gildea, M.A., J.C.L., S.T.B., Diocesan Superintendent of Schools, 257 E. Onondaga Street, Syracuse, N. Y.

North Carolina

RALEIGH—Rev. Michael J. Begley, Diocesan Superintendent of Schools, Wrightsville, N. C.

BELMONT ABBEY NULLIUS—Rev. Thomas Oestreich, O.S.B., S.T.D., Chancellor, Belmont, N. C.

North Dakota

BISMARCK—Rev. Bonaventure Goebel, O.S.B., Chancellor, St. Alexius Hospital, Bismarck, N. Dak.

FARGO—Rev. William T. Mulloy, Diocesan Superintendent of Schools, 723 Kittson Avenue, Grafton, N. Dak.

Ohio

CINCINNATI *—Rev. Carl J. Ryan, Ph.D., Diocesan Superintendent of Schools, 28 Calhoun Street, Cincinnati, Ohio.

CLEVELAND—Rt. Rev. Msgr. John R. Hagan, Ph.D., Diocesan Superintendent of Schools, 621 N. B. C. Building, Cleveland, Ohio.

COLUMBUS—Rt. Rev. Msgr. John J. Murphy, Diocesan Superintendent of Schools, 1651 East Main Street, Columbus, Ohio.

TOLEDO—Rev. Norbert M. Shumaker, Ph.D., Diocesan Superintendent of Catholic Schools, 807 Superior Street, Toledo, Ohio.

Oklahoma

OKLAHOMA CITY and TULSA—Rev. J. B. Dudek, Chancellor, 1000 North Lee Avenue, Oklahoma City, Okla.

Oregon

PORTLAND *—Rev. Wm. S. Scandlon, C.S.C., Diocesan Superintendent of Schools, 2053 S. W. 6th Avenue, Portland, Ore.

BAKER CITY—Rev. John D. Lee, Diocesan Superintendent of Schools, Baker, Ore.

Pennsylvania

PHILADELPHIA *—Rt. Rev. Msgr. John J. Bonner, D.D., LL.D., Superintendent of Parochial Schools, 19th and Wood Streets, Philadelphia, Pa.

ALTOONA—Rev. Francis McNelis, Diocesan Superintendent of Schools, 511 20th Street, Altoona, Pa.

ERIE—Rev. Joseph J. Wehrle, S.T.D., Superintendent of Catholic Schools, 225 West 9th Street, Erie, Pa.

HARRISBURG—Rev. Harold E. Keller, Diocesan Superintendent of Schools, 22nd and Market Streets, Harrisburg, Pa.

PITTSBURGH—Rev. Paul E. Campbell, Diocesan Superintendent of Schools, 5325 Penn Avenue, Pittsburgh, Pa.

SCRANTON—Rev. J. J. Featherstone, M.A., J.C.L., Diocesan Superintendent of Schools, 315 Wyoming Avenue, Scranton, Pa.

Rhode Island

PROVIDENCE—Rev. Thomas V. Cassidy, M.A., S.T.L., Diocesan Superintendent of Schools, 25 Fenner Street, Providence, R. I.

South Carolina

CHARLESTON—Rt. Rev. Joseph L. O'Brien, Diocesan Superintendent of Schools, 136 St. Philip Street, Charleston, S. C.

South Dakota

RAPID CITY—Rev. Michael T. Costigan, Chancellor, 1622 West Boulevard, Rapid City, S. Dak.

SIOUX FALLS—Rt. Rev. Msgr. W. S. O'Meara, Diocesan Superintendent of Schools, Watertown, S. Dak.

Tennessee

NASHVILLE—Rev. George J. Flanigen, Diocesan Superintendent of Schools, 328 Fifth Avenue N., Nashville, Tenn.

Texas

SAN ANTONIO *—Very Rev. A. H. Rabe, S.M., President of the School Board, 230 Dwyer Avenue, San Antonio, Texas.

AMARILLO—Rev. Newton T. Miller, Chancellor, 1110 Washington Street, Amarillo, Texas.

CORPUS CHRISTI—Rev. James H. Kelly, Diocesan Superintendent of Schools, P. O. Box 284, Rockport, Texas.

DALLAS—Rev. Thomas S. Zachry, Diocesan Superintendent of Schools, 2215 Ross Avenue, Dallas, Texas.

EL PASO—Very Rev. J. C. M. Garde, Chancellor, 1012 North Mesa Avenue, El Paso, Texas.

GALVESTON—Rt. Rev. Jacob Schnetzer, Diocesan Superintendent of Schools, 4015 Sherman Avenue, Houston, Texas.

Utah

SALT LAKE CITY—Rev. Thomas F. Butler, Diocesan Superintendent of Schools, 650 S. 11th East Street, Salt Lake City, Utah.

Vermont

BURLINGTON—Very Rev. William P. Crosby, President of the School Board, 7 Fullerton Avenue, Montpelier, Vt.

Virginia

RICHMOND—Rev. Francis J. Byrne, Diocesan Superintendent of Schools, 811 Cathedral Place, Richmond, Va.

Washington

SEATTLE—Rev. Edward J. McFadden, Diocesan Superintendent of Schools, 907 Terry Avenue, Seattle, Wash.

SPOKANE—Rev. Roy E. Thelen, Chancery Office, 1115 West Riverside Avenue, Spokane, Wash.

West Virgina

WHEELING—Rev. John J. O'Brien, Superintendent of Parochial Schools, 464 Washington Avenue, Clarksburg, W. Va.

Wisconsin

MILWAUKEE *—Rev. Edmund J. Goebel, Diocesan Superintendent of Schools, 625 North Milwaukee Street, Milwaukee, Wis.

GREEN BAY—Rev. E. J. Westenberger, Ph.D., Diocesan Superintendent of Schools, 128 South Monroe Street, Green Bay, Wis.

LA CROSSE—Rev. Lester W. Seemann, Diocesan Superintendent of Schools, 3222 South Avenue, La Crosse, Wis.

SUPERIOR—Rev. Joseph Annabring, Diocesan Superintendent of Schools, 1201 Hughitt Avenue, Superior, Wis.

Wyoming

CHEYENNE—Rev. James A. Hartmann, Chancellor, Box 497, Cheyenne, Wyo.

SECTION XVIII
AIDS AVAILABLE TO LOCAL SCHOOL BOARDS FROM STATE DEPARTMENTS

PARTICIPATION OF STATE AGENCIES IN PLANNING AND SUPERVISING LOCAL SCHOOL-BUILDING DEVELOPMENT

IN the planning of buildings for a public school system, it frequently is desirable to know the degree to which the state board of education has provided for participation and cooperation. The following summary segregates the character of the supervision given by the state and its representative agencies under three headings. The first item indicates the action which the state board may be expected to take. The second item shows the part played by the state superintendent of schools as the official spokesman for the state department of education. In the third part will be found indications of the assistance or guidance which other state agencies will give. The form of tabulation has necessitated very brief statements covering these responsibilities, but the degree and character of participation are clearly shown for each state. The list has been revised up to December, 1938.

THE STATES' PARTICIPATION IN SCHOOL-BUILDING CONSTRUCTION

Alabama

State Board of Education, Montgomery
Approves rules and regulations submitted by state superintendent.
State Superintendent of Education, A. H. Collins
Prepares and submits to the state board of education rules and regulations pertaining to: minimum standards for school sites; minimum standards for plans, specifications, and construction of school buildings; for the issuance of warrants for capital outlay purposes.
Schoolhouse planning is a service in the division of administration and finance. In addition to the preparation of rules and regulations as listed above, the following services are rendered:
Plans and specifications are prepared for rural school building construction.
Plans and specifications prepared by private architects are approved.
Buildings in process of construction are inspected upon request to determine whether plans and specifications are being followed.
Rules and regulations of the state board are administered to insure the proper execution.
School surveys set up a practicable long-time program for locating school centers, for school-building construction and maintenance, for tax districts, for school finance, for capital outlay debt service, for safe and adequate school transportation where needed, for the teaching personnel, for child accounting, and for record keeping. The state institutions of higher learning cooperate in furnishing trained and experienced consultants on survey work. No capital outlay expenditures can be made except at school centers approved by the survey program. The school-building program is determined in terms of the curriculum, road conditions, public school fund, and transportation which may be made available.
Each county is required to submit annually a building and capital outlay program which must be approved before actual work on the program is undertaken.
Director of the Division of Administration and Finance, R. L. Johns, Acting
Supervisor of Schoolhouse Planning, R. E. Ledbetter
Architect, Clyde C. Pearson

Arizona

State Board of Education, Phoenix
No jurisdiction whatever in regard to buildings erected by districts.
State Superintendent of Public Instruction, H. E. Hendrix
No jurisdiction.
Other Agencies
Board of health issues regulations.

Arkansas

State Board of Education, Little Rock
Has a division of school grounds and schoolhouse planning.
Director prepares plans for 1- to 7-teacher buildings, and for such buildings as teachers' homes, shops, home economics buildings, gymnasiums, etc.
Furnishes preliminary sketches of floor plans for larger buildings.
Checks architects' plans for school buildings upon request.
Advises school officials as to plans for remodeling, repairing and altering school buildings.
Advises superintendents and teachers as to interior arrangements, furniture and equipment.
Superintends the construction of all school buildings during progress of erection, except when the district employs an architect.
State Commissioner, T. H. Alford
No legal provision for approval.
Director, School Plant Division, J. Odell Baker

California

State Superintendent of Public Instruction, Walter F. Dexter, Sacramento
Division of schoolhouse planning passes on all plans costing more than $5,000, excepting those in the largest cities; is called into consultation by city districts, and controls other situations by surveys.
Site sizes and locations controlled by state standards.
No building contract, in situations coming under the department's jurisdiction, is legal without the required approval.
This department does not make working drawings.
Chief of Division of Schoolhouse Planning, Dr. Charles W. Bursch

Colorado

State Superintendent of Public Instruction, Mrs. Inez Johnson Lewis, Denver
School building handled by local boards of education.

Connecticut

State Board of Education, Hartford
Has a section of buildings and plans which approves plans for enlargement and new construction. It inspects school buildings for safety.
Publishes standards for guidance of local boards.
Has architect to whom plans are referred.
Assists local communities in building surveys.
State Commissioner, A. G. Grace
Assistant Supervisor of Buildings and Plans, John E. Nichols

Delaware

State Board of Education, Dover
Outside Wilmington prepares a tentative program of school building to submit to local boards.
Hears comments and suggestions thereon.
Creates standards with effect of law, governing hygienic, sanitary, and protective construction; selection, arrangement, and maintenance of sites; condemns school buildings.
Has approval of plans and specifications.
State Superintendent of Public Instruction, Dr. H. V. Holloway
Building Program
There has been no appropriation of funds under the above for the last two years.
Other Agencies
Legislature has created a state school-building act.
There is a state school-building account.
State school-building commission for each district.
Plans approved by state board of education and commission.
Buildings built by commission.
Construction supervised by commission.
Board of health has to approve drinking water and sewage disposal.

Florida

State Board of Education, Tallahassee
Prescribes rules and regulations and minimum standards in the field.
State Superintendent of Public Instruction, Colin English
Has oversight, charge, and management of all matters pertaining to public schools, school buildings and grounds.
The state department renders the following services:
1. In cooperation with county boards of public instruction, carries on surveys to determine where elementary and secondary school centers should be located, the steps that should be taken in carrying out the building program, and the means of financing the building program.
2. All capital outlay projects are submitted along with the annual school budget. Advice is rendered in connection with these proposals.
3. All plans for school buildings to be constructed are submitted to the department for approval. When necessary, recommendations are given relating to desirable improvements in the plans.
4. Plans are prepared for some of the buildings where architectural services are not available. Consultative and advisory services relating to the letting of contracts and other problems involved in the planning and construction of school buildings are provided through this department.

Director of Administration and Finance, Edgar L. Morphet
Has direction of Division, which includes work in surveys, transportation, school plant planning, and architectural service.
School Plant Planning Service, J. L. Graham
School Architect, James A. Stripling
School Surveys and Transportation, Paul Eddy

Georgia

State Superintendent of Schools, Dr. M. D. Collins, Atlanta
Furnishes plans and specifications for school-building guidance in local units.
Supervisor of schoolhouse construction prepares plans for 1- to 6-teacher buildings; prepares school ground plans; checks architects' plans; advises school officials.
Other Agencies
County superintendent and county board of education approve plans.

Idaho

State Board of Education, Boise
Standardization of:
Sanitary appliances
School furniture
School equipment and supplies
School buildings
Issues plans for 1-, 2-, 3-room buildings.
Requires approval of all plans.
State Superintendent, J. W. Condie
Member of state board of education and its executive officer.
Other Agencies
Department of public welfare has to cooperate with state board of education in its duties regarding schools.
County superintendent has power to require local trustees to conform to rules of state board "if there is money enough."
County board of health is responsible for sanitation in schools.

Illinois

State Superintendent of Public Instruction, John A. Wieland, Springfield
Prepares, with advice of state board of health, state architect, and state fire marshal, specifications for minimum requirements in heating, ventilation, lighting, seating, water supply, toilets, safety against fire.
These have force of law.
Other Agencies
State architect is required to assist the state superintendent of schools.
Enforcement of law is in the hands of county superintendents and local authorities.
County superintendent advises school officials in details of construction, but only on standards is it necessary to follow him.
County superintendent inspects buildings.
Board of directors and board of education required to submit plans to county superintendent.

Indiana

State Superintendent of Public Instruction, Floyd I. McMurray, Indianapolis
Other Agencies
Local school trustees erect buildings. Plans and specifications must be submitted to state board of health for approval of sanitation and hygiene; to state board of accounts for adequacy of specifications and fair competition; and to state fire marshal for compliance with state fire laws.
State board of health issues standards.

Iowa

State Superintendent of Public Instruction, Agnes Samuelson, Des Moines
Shall prepare and publish, when deemed necessary, a pamphlet containing suitable plans and specifications.

Kansas

State Board of Education, Topeka
"No provision in the laws to prevent the erection of undesirable buildings or to compel the discontinuance of buildings that should be abolished immediately, further than plans for all new school buildings must be submitted to the state architect as to provision for fire protection according to law." Section 367, Revised School Laws of Kansas for 1937.
Has adopted standardization of rural schools involving among other things: out-building; school-building equipment; and the school building itself.
State Superintendent of Public Instruction, W. T. Markham
Criticizes and approves plans submitted voluntarily by local authorities.
State Architect, Thomas Nall

Kentucky

State Board of Education, Frankfort
Authorized to approve and adopt regulations for the sanitary and protective construction of public school buildings.
State Superintendent of Public Instruction, H. W. Peters
With concurrence of state board of health prepares regulations for the sanitary and protective construction of public school buildings. Prepares plans and specifications for 1- to 4-teacher public school buildings, for adoption by the state board of education. Examines and approves or disapproves plans and specifications submitted by county boards of education and graded boards of education.
Director of School Buildings and Grounds, J. W. Brooker

Louisiana

State Superintendent of Public Education, T. H. Harris, Baton Rouge
The state law requires approval of all school plans by the state superintendent. Plans must be drawn by licensed school architects.
Other Agencies
The state law requires that the school plans shall be approved by the state board of health, fire marshal, and parish school board.

Maine

State Commissioner of Education, Bertram E. Packard, Augusta
No school building can be built or repaired without his approval, where the expenditure is in excess of $500.
Provides plans for 1- to 4-room buildings free of cost.
Issues minimum requirements so that local units will be able to meet his approval of plans.

Other Agencies
No school building can be built or repaired without approval of board of health, where the expenditure is in excess of $500.

Maryland

State Board of Education, Baltimore
Elementary schools. Standardization includes grounds, buildings, lighting, heating and ventilation, library, equipment.
Has issued "Standards for School Buildings" as a guide to county superintendents.
State Superintendent of Schools, Dr. Albert S. Cook
Sites and plans must be submitted to him for approval, additions to buildings also.
After plans have been approved by the state consultant architect, the state superintendent issues certificate without which no building costing $300 or more can be erected (Sec. 30, Article 77, Annotated Code of Maryland).
Other Agencies
Plans must be submitted to state board of health for approval of sewage-disposal arrangements and plumbing.

Massachusetts

State Department of Education, Boston
Acts in an advisory rather than supervisory capacity.
State Commissioner of Education, James G. Reardon
Assistants of superintendent do much in consulting with local committees. Loan slides.
Other Agencies
Department of public works issues school-bus regulations.
Department of public safety issues regulations.
Director of Buildings' Inspection Division, Department of Public Safety, J. J. Carey, State House, Boston

Michigan

State Department of Public Instruction, Lansing
Provides consultation to boards of education and school administrators regarding surveys, legal procedures, finance, and educational designing.
Assists in planning and executing building program, upon invitation.
State Superintendent, Eugene B. Elliott
Other Agencies
State fire marshal cooperates for elimination of fire hazards.
State department of health cooperates for provision of proper sanitation.
Public debt commission assists in problems of debt service.

Minnesota

State Board of Education, St. Paul
Prints and distributes laws and rules governing public school buildings and sites.
Supplies inspection service and advises local school officials relative to school building problems in heating, ventilation, illumination, alteration, operation, maintenance, and financing.
Assists architects and public school officials in functional planning of school buildings.
Prepares and supplies gratis to school boards plans and specifications for one and two room school houses.
State Commissioner, John Gundersen Rockwell
Examines all plans and specifications with power of approval or otherwise.
Prescribes rules for schoolhouse construction, including therein rules of the board of health relative to sanitary standards for toilets, water-supply, and disposal of sewage.
He may condemn buildings under his own or the state board of education's rules.
Other Agencies
Division of sanitation, state board of health, examines and approves all school-building plans relative to water supply, sewage disposal and plumbing systems.
The law authorizes county superintendent to advise rural school boards in regard to buildings, ventilation, and school grounds.
Director, Division of Buildings and Business Administration, I. O. Friswold

Mississippi

State Department of Education, Jackson
Has a division of school building service. This division:
Cooperates in making surveys on the effective organization of schools.
Makes surveys to determine building needs.
Outlines building programs.
Approves architects' plans and specifications for school buildings.
Furnishes free plans and specifications for some small school buildings, teachers' homes and accessory buildings.
General advisory service on school-plant planning and equipment and on the effective use of the school plant.
State Superintendent, J. S. Vandiver
School Building Service, W. G. Eckles, State Director

Missouri

State Superintendent of Education, Jefferson City
Provides standards for schoolhouse planning, provides plans for one-, two-, and three-room buildings, makes surveys and sets up educational specifications for buildings to be erected, checks and approves plans and specifications, also contracts let, provides school-building insurance surveys, and maintains a state-wide system of janitorial training schools.
State Superintendent of Public Schools, Lloyd W. King
Other Agencies
The State Department of Public Health aids in checking the water supply.
Director of School Building Service, N. E. Viles

Montana

State Board of Education, Helena
Publishes a bulletin containing a list of standards for rating 1- and 2-room schools.
State Superintendent of Public Instruction, Ruth Reardon
Plans are furnished local boards by the board of health.

Nebraska

State Superintendent of Public Instruction, Charles W. Taylor, Lincoln
Advises with school authorities regarding building programs when officials request conferences. The state department does not maintain technically trained people for this service, and Nebraska has no law requiring construction according to specifications.

Nevada

State Department of Education, Carson City
Must prepare plans and specifications for rural schoolhouses on standard lines of school architecture as to size, lighting, heating, ventilation and general sanitation. The trustees of rural schools needing new schoolhouses shall be supplied with such plans and specifications upon request.
No public schoolhouse may be erected in any school district until the plans have been approved by the deputy superintendent of public instruction.
State Superintendent of Public Instruction, Miss Mildred Bray

New Hampshire

State Board of Education, Concord
State Commissioner, James N. Pringle
Interprets meaning of "suitable and sanitary" buildings for all schools. Has general authority to make regulations. Cooperates with superintendents and local school boards in planning buildings.
Recommends to state board of health investigation of unsuitable buildings.
Administrative Field Agent, Paul E. Farnum
Other Agencies
State board of health, on complaint, may condemn or order buildings improved at expense of districts.

New Jersey

State Board of Education, Trenton
Advice and consent to appointment of building inspector by commissioner of education.
Approves plans and specifications for all schoolhouse construction.
Has set up a school building code.
State Commissioner of Education, Dr. Charles H. Elliott
Appoints an inspector of school buildings, with advice and consent of state board of education.
May instruct county and city superintendents as to constructing schoolhouses and furnishing them.
Assistant Commissioner of Education, Charles D. Anderson
Supervisor of school buildings.
Inspector of School Buildings, Seymour Williams
Recommends approval of plans and specifications for schoolhouse construction.
Inspects all new construction and old buildings.
Advises local school officials on school building needs.
Assists in school building surveys.

Other Agencies
County superintendent has power to inspect the condition of schoolhouses, sites, etc., and to advise with local boards in respect to construction, heating and ventilation, and lighting. May, with consent of commissioner of education, cause state moneys to be withheld where facilities are not in accord with legal requirements.
Local boards provide school buildings.

New Mexico

State Superintendent of Public Instruction, Mrs. Grace J. Corrigan, Santa Fe

New York

State Education Department, Albany
Has a division of school buildings and grounds with a director.
Has set up standards.
Board issues a pamphlet of information for local authorities.
Makes inspections of sites and school conditions before definite action is taken by local authority.
Advises with superintendents, principals, and boards in regard to needs and best way to meet them.
Examines preliminary plans.
State Commissioner, Dr. Frank P. Graves
All plans and specifications must receive the commissioner's approval in all districts other than first and second class cities.
He cannot approve unless plans conform to laws.
No tax can be levied until plans are approved.
Director of School Buildings and Grounds Division, Gilbert L. Van Auken

North Carolina

State Board of Education, Raleigh
Has a division of schoolhouse planning.
There is a Literary Loan Fund from which loans are made when plans are approved.
Suggestions for planning school plants are distributed from time to time by state department of public instruction.
Has plans for one-story schools and gymnasiums which are distributed free by director of schoolhouse planning.
State Superintendent of Public Instruction, Clyde A. Erwin
Law requires that all plans be approved by state superintendent of public instruction.
Other Agencies
State insurance commissioner for fire safety, and state board of health for sanitary facilities.
Director, Division of Schoolhouse Planning, W. F. Credle

North Dakota

State Superintendent of Public Instruction, Arthur E. Thompson, Bismarck
Plans must be submitted to and approved by superintendent.

Ohio

State Director of Education, E. N. Dietrich, Columbus
Other Agencies
Has a state building code (very elaborate).
All plans must be approved by chief inspector of workshops and factories, except in cities having regularly organized building inspection departments.
District health commissioner checks plans for water-supply and sanitary arrangements. State department of health may make surveys and issue orders as to these matters.

Oklahoma

State Superintendent of Public Instruction, A. L. Crable, Oklahoma City
Prepares complete plans and specifications when requested for the construction of school buildings for four teachers or less, costing less than $10,000.
Makes school-building survey for all sizes of buildings.
Approves plans of all sizes but approval is not required by law.
Other Agencies
Standard building laws.
Book of 300 plans in hands of each county superintendent in the state.
Director of Schoolhouse Planning, Frank Williams

Oregon

State Superintendent of Public Instruction, Rex Putnam, Salem
Manual on "The Construction and Care of School Buildings" issued to all school districts. No legal provision for the approval of the state department, but an advisory service is maintained.
Other Agencies
Plans for schools in third-class districts must be approved by county school superintendents.
County superintendents advise with the school boards relative to the construction, warming, ventilating, and arrangement of schoolhouses.

Pennsylvania

State Department of Public Instruction, Harrisburg
Has a division of school buildings.
Prescribes rules and regulations and makes such recommendations as it may deem expedient to promote physical and moral welfare of school children.
Department code—
Required to approve plans in 2nd, 3rd, 4th class districts.
Supervises preparation of plans in local communities.
Submits suggestive sketches.
State Superintendent of Public Instruction, Dr. Lester K. Ade
Other Agencies
State code.
Art commission passes on architectural design.
Department of labor and industry passes on fire and panic protection.
Chief, Division of School Plant, Dr. HuBert C. Eicher

Rhode Island

State Director of Education, James F. Rockett, Providence
Part of the income of the permanent school fund may be apportioned by the director of education to assist towns in constructing model school buildings.

South Carolina

State Superintendent of Education, Dr. James H. Hope, Columbia
Division of schoolhouse planning and construction. Plans must be submitted to and approved by the director of schoolhouse planning.
The director inspects all plans and new buildings, and a certificate of approval is necessary before they can be used.
Plans and specifications and supervision of construction are furnished to small schools not employing an architect.
Other Agencies
Has a state building code.
Director of Schoolhouse Planning, S. P. Clemons

South Dakota

State Superintendent of Public Instruction, J. F. Hines, Pierre
Plans must be approved by him, and show heating and ventilation scheme. He assists in an advisory capacity in the planning of school buildings; he also helps boards in various ways to show their communities the needs of new buildings and additions to buildings.

Tennessee

State Commissioner of Education, Halbert Harvill, Nashville
Division of schoolhouse planning furnishes working drawings and specifications for buildings up to and including four-teacher buildings. The division offers functional planning advice, and checks plans for larger buildings, where such service is requested.
State Director of Schoolhouse Planning, E. L. Mitchell

Texas

State Board of Education, Austin
Purchases school district bonds or grants waiver for district to sell in open market.
State Superintendent, L. A. Woods
Administrative officer of public school laws and ex officio secretary of the state board, receives reports required by statute and is general superintendent of business relating to the public schools.
Other Agencies
School-building code.
Plans must be submitted as follows for approval: (1) in a common school district—to the county superintendent; (2) independent district and city or town—to superintendent of schools.
These agencies report to state department what they have done and transmit evidence.

State Director of School Plant Division, J. Fred Horn
Prepares plans for 1- to 6-teacher buildings, and suggestive sketches for larger buildings; advises school officials; checks architects' plans; makes school-building surveys upon invitation; visits local units upon invitation.

Utah

State Board of Education, Salt Lake City
There are two department building codes.
First is in abeyance though not exactly discarded.
They have operated under the second one 6 years.
State Superintendent of Public Instruction, C. H. Skidmore
Where the expenditure is in excess of $5,000, his approval of plans and specifications is required before construction may be undertaken.
Is required to formulate a code to govern preparation of plans by local communities.
May hire an architect to examine plans or inspect buildings and where necessary shall make recommendations for conformity to code.

Vermont

State Board of Education, Montpelier
Public school buildings are standardized with "points" on buildings, grounds, equipment.
Plans "should be" submitted to state board.
Issues plans, pictures and bulletins.
Employs a full-time draftsman to prepare plans and specifications for rural communities without charge.
Provides for follow-up work during the period of construction.
State Commissioner, Francis L. Bailey
Other Agencies
Plans "must be" submitted to board of health.

Virginia

State Board of Education, Richmond
Has a division of school buildings.
Prepares plans and specifications for smaller towns and cities.
Supervises construction free of charge.
Minimum standards have been set up and approved.
Cooperates with local boards in:
(a) Preparing preliminary plans.
(b) Getting out final plans.
(c) Attendance at opening of proposals.
(d) Inspection every 2 weeks during construction, additional upon request of contractor or local board.
State Superintendent of Public Instruction, Sidney B. Hall
State Director, Division of Buildings, Raymond V. Long

Washington

State Superintendent of Public Instruction, Olympia
Has been given "some power" through law on "wider use of school plant."

State Superintendent of Public Instruction, Stanley F. Atwood
Other Agencies
County superintendents approve plans in 3rd class districts.

West Virginia

State Board of Education, Charleston
May require all plans and specifications for the erection of school buildings to comply with the requirements of law; and may require all county boards to submit all plans and specifications for the state board's approval.
State Superintendent of Free Schools, W. W. Trent

Wisconsin

State Department of Public Instruction, Madison
Under a cooperative agreement between the industrial commission and the department, all school plans are sent to the latter by the commission for checking and suggestive criticisms looking towards the erection of first class buildings.
Helps local communities by suggesting plans for all types of buildings to serve as a basis for extended work by commercial architects.
Service has been extended to cover expert advice on heating, ventilation, lighting.
The department develops complete plans and specifications and gives architectural service for 1- and 2-room rural schools on request.
Inspects all types of schools with a view to improving housing conditions and facilities; makes complete building surveys in all types of communities on request.
Gives field service and makes inspection upon request.
State Superintendent of Public Instruction, John Callahan
Other Agencies
The law requires submission of all school plans to industrial commission. This checking refers primarily to the application of the state building code and pays attention primarily to construction, safety and sanitation.
Supervisor of School Building Service, H. W. Schmidt

Wyoming

State Superintendent of Public Instruction, Esther L. Anderson, Cheyenne
Entrusted with general supervision of the public schools of the state. The commissioner of education works under his direction.
Commissioner of Education, R. L. Markley
He shall prepare for the use and guidance of the district board regulations and suggestions for standardizing and grading schools and for the hygienic and sanitary building of schoolhouses and the selection of sites.

AMERICA'S FINEST AND MOST COMPLETE LINE OF WORKSHOP TOOLS.

READ
The facts about DURO machinery
How *Quality* is built into every machine whether it costs $5.00 or $100.00

STUDY
The *Many features* offered
Advanced engineering-
Precision workmanship and modern design

ANALYZE
The *Values* offered-
The *Extra* parts included
The practical mechanical adjustments and many other features of DURO MACHINERY

A copy of our latest catalog or any information pertaining to Woodworking Tools will be sent free upon request with no obligation.

DURO METAL PRODUCTS CO

DEPARTMENT A-1

2649 N. KILDARE AVE. CHICAGO ILL.

These postcards are supplied for your convenience in securing catalogs or quotations without charge or obligation to you.

All requests will receive prompt attention.

The American School and University

Catalog Service Dept.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

ASA

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

ASA

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

ASA

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

ASA

These postcards are supplied for your convenience in securing catalogs or quotations without charge or obligation to you.

•

All requests will receive prompt attention.

The
American School
and University

Catalog Service Dept.

SECTION XIX

CLASSIFIED INDEX TO MANUFACTURERS' PRODUCTS

Absorbent Papers & Specialties
Eaton-Dikeman Co., 497

Acoustical Materials
F. E. Berry, Jr. & Co., Inc., 601-604
Celotex Corp., 77-81
Johns-Manville, 82, 83
Wood Conversion Co., 84

Adding Machines
Burroughs Adding Machine Co., 401-404
Remington Rand Inc., 369-375
L. C. Smith & Corona Typewriters, Inc., 400
Underwood Elliott Fisher Co., 398, 399

Address Systems (see Public Address Systems)

Air Conditioning
John J. Nesbitt, Inc., 98
B. F. Sturtevant Co., 99

Aluminum Castings
Oliver Machinery Co., 530

Ammeters & Voltmeters (see Meters, Electric)

Ammonia, Aqua & Anhydrous
Mathieson Alkali Wks., 279
Pennsylvania Salt Manufacturing Co., 280

Amplifiers
DeVry Corp., 323
General Radio Co., 503
Graybar Electric Co., 333
RCA Mfg. Co., Inc., 329-332
Western Electric Co., 334, 335

Appraisal Engineers
Lloyd-Thomas Co., 179-182

Asbestos Products
Johns-Manville, 82, 83

Asphalt
Barrett Co., 85
Socony-Vacuum Oil Co., Inc., 227
Texas Co., 89

Asphalt Floor Finishes
Asphalt Products Co., Inc., 184

Asphalt Mastic Floors
United Laboratories, Inc., 200, 201

Asphalt Planking
Servicised Products Corp., 65

Asphalt Shingles
Barrett Co., 85

Asphalt Tile Flooring
Johns-Manville, 82, 83
Thos. Moulding Floor Mfg. Co., 62
Tile-Tex Co., 56-59

Athlete's Foot Preventive
American Playground Device Co., 284, 285
Hillyard Sales Co., 186, 187
Midland Chemical Laboratories, 192-194
Pennsylvania Salt Manufacturing Co., 280

Audiometers (for Testing Hearing)
Graybar Electric Co., 333
Western Electric Co. (Distributed by Graybar Electric Co.), 334, 335

Audiphones (for the Hard of Hearing)
Western Electric Co., 334, 335

Auditorium Lighting (see Lighting Equipment)

Auditorium Seating
Heywood-Wakefield Co., 336
Theodor Kundtz Co., 337

Autoclaves
F. J. Stokes Machine Co., 498

Automatic Sprinkler Systems
Rockwood Sprinkler Co., 132

Automatic Telephone Systems (see Telephone Systems)

Automatic Timers & Scoreboards
Fair-Play Co., 275

Backstops, Tennis Court, Baseball and Basketball
Anchor Post Fence Co., 228
Cyclone Fence Co., 231
Everwear Mfg. Co., 283
Fred Medart Manufacturing Co., 276; 392
W. F. Robertson Steel & Iron Co., 232
Stewart Iron Works Co., 233
Wickwire Spencer Steel Co., 234

Balopticons
Bausch & Lomb Optical Co., 325; 495

Band Saws
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Walker-Turner Co., 522, 523
Yates-American Machine Co., 524, 525

Barbed Wire
Continental Steel Corp., 229
Copperweld Steel Co., 230

Baseboard, Metal
Milcor Steel Company, 94, 95

Basket Ball Equipment
Anchor Post Fence Co., 228

Baskets, Wire Gymnasium
Durabilt Steel Locker Co., 380, 381
Worley & Co., 393

Bath Tubs
Crane Co., 106

Bathroom Cabinets
Miami Cabinet Div., Philip Carey Co., 442, 443

Bathroom Fixtures
Miami Cabinet Div., Philip Carey Co., 442, 443

Baths, Chemists' Laboratory
General Ceramics Co., 491
Kewaunee Mfg. Co., 488
Maurice A. Knight, 492
United States Stoneware Co., 494

Baths, Shower
Bradley Washfountain Co., 107
Crane Co., 106

Batteries, Electric Storage
Thomas A. Edison, Inc., 506
Electric Storage Battery Co., 133; 507
Standard Electric Time Co., 125

Beds & Bedding
Doehler Metal Furniture Co., Inc., 437-440
L. & J. G. Stickley, Inc., 441
Nathan Straus-Duparquet, Inc., 461

Bells, Electrical & Mechanical
American District Telegraph Co., 128, 129
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125
Thomas-Smith Co., 127

Benches, Campus (see Settees)

Benches, Locker Room
Durabilt Steel Locker Co., 380, 381
Worley & Co., 393

Benches, Manual Training
Kewaunee Mfg Co., 488
Lyon Metal Products, Inc., 386, 387
New Britain Machine Co., 537
Oliver Machinery Co., 530
Worley & Co., 393

Benches, Saw
American Saw Mill Machinery Co., 519
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Walker-Turner Co., 522, 523

Bicycle Racks
American Playground Device Co., 284, 285

Binoculars
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Blackboard Cleaners
Hillyard Sales Co., 186, 187
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191

Blackboard Glass
Blue Ridge Glass Corp., 142, 143
New York Silicate Book Slate Co., Inc., 147

Blackboard Slate
Bolger-Heller Slate Co., 146
Natural Slate Blackboard Co., 144

Blackboard Trim and Crayon Troughs
Art Metal Construction Co., 359-368
Andrew Hoffman, 594
Milcor Steel Company, 94, 95

Blankets
Nathan Straus-Duparquet, Inc., 461

Bleachers and Grandstands
Universal Bleacher Co., 278

Blowers, Organ
Spencer Turbine Co., 199

Blowers, Turbo Compressor
Spencer Turbine Co., 199

Blueprint Washing Tanks & Wringers
Wickes Bros., 538

Blueprinting Machines, Continuous
Wickes Bros., 538

Boards, Bulletin and Directory
Art Metal Construction Co., 359-368
Congoleum-Nairn, Inc., 60, 61
Remington Rand Inc., 369-375
Tablet & Ticket Co., 464

Bodies, School Bus
Bender Body Co., 551
International Harvester Co., 552

Boiler Compounds
Midland Chemical Laboratories, Inc., 192-194

Book Binding Materials
E. I. du Pont de Nemours & Co., Inc., 608, 609

Book Cases & Cabinets
All-Steel-Equip Co., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Doehler Metal Furniture Co., 437-440
Durabilt Steel Locker Co., 380, 381
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
L. & J. G. Stickley, Inc., 441

Book Racks
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Durabilt Steel Locker Co., 380, 381
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Lyon Metal Products, Inc., 386, 387
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Yawman and Erbe Mfg. Co., 376

Bookkeeping Machines
Burroughs Adding Machine Co., 401-404
Remington Rand Inc., 369-375
Underwood Elliott Fisher Co., 398, 399

Books (see Textbooks)

Boxes, Metal, Shop
All-Steel-Equip Co., Inc., 377
General Fireproofing Co., 382, 383; 486, 487
Lyon Metal Products, Inc., 386, 387
Fred Medart Manufacturing Co., 276; 392

Boxes, Steel Transfer
All-Steel-Equip Co., Inc., 377

Bread Slicers
Hobart Mfg. Co., 456
Oliver Machinery Co., 530
John E. Smith's Sons Co., 457
Nathan Straus-Duparquet, Inc., 461

Bridges, Electric
General Radio Co., 503

Broilers, Electric
Edison General Electric Appliance Co., 451

Bronze Tablets
General Bronze Corp., 136
James H. Matthews & Co., 150

Brushes
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
Selig Co., 190, 191

Bubbler Heads
Crane Co., 106

Building Papers
Barrett Co., 85
Servicised Products Corp., 65

Built-Up Roofing
Barrett Co., 85
Ruberoid Co., 87
Servicised Products Corp., 65
Texas Co., 89

Bulbs, Flower
Stumpp & Walter Co., 218

Bulletin Boards (see Boards, Bulletin)

Burglar Alarms
American District Telegraph Co., 128, 129

Buses
Bender Body Co., 551
International Harvester Co., 552

Cabinets, Bathroom
Miami Cabinet Div., Philip Carey Co., 442, 443

Cabinets, Filing
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Yawman and Erbe Mfg. Co., 376

Cabinets, Key
Durabilt Steel Locker Co., 380, 381
P. O. Moore, Inc., 153-155

Cabinets, Kitchen
Excel Metal Cabinet Co., Inc., 427-433
St. Charles Manufacturing Co., 434, 435

Cabinets, Museum (see Cases, Museum & Display)

Cabinets, Phonograph Record
RCA Mfg. Co., Inc., 329-332

Cabinets, Special (X-Ray, Film, etc.)
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Capitol Stage Lighting Co., 339
Doehler Metal Furniture Co., 437-440
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385

Cabinets, Storage
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Diebold Safe & Lock Co., 379
Doehler Metal Furniture Co., Inc., 437-440
Durabilt Steel Locker Co., 380, 381
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Lyon Metal Products, Inc., 386, 387
Fred Medart Manufacturing Co., 276; 392
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Worley & Co., 393
Yawman and Erbe Mfg. Co., 376

Cabinets, Type
American Type Founders, 533-536

Cafeteria Equipment
Aluminum Cooking Utensil Co., 454
G. S. Blodgett Co., Inc., 447
Carbide and Carbon Chemicals Corp., 449
Chelsea Products, 458
Cleveland Range Co., 450
Corning Glass Works, 110-113; 455
Crucible Steel Co. of America, 452a, 452b
Doehler Metal Furniture Co., Inc., 437-440
Edison General Electric Appliance Co., 451
Hobart Mfg. Co., 456
Kewaunee Mfg. Co., 488
Mutschler Brothers Co., 436
Albert Pick Co., Inc., 460
Republic Steel Corp., 91; 448
John E. Smith's Sons Co., 457
Standard Gas Equipment Corp., 452
L. & J. G. Stickley, Inc., 441
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Cafeteria Supplies
John Sexton & Co., 463

Calcium Chloride
Columbia Alkali Corp., 226
Pennsylvania Salt Manufacturing Co., 280
Solvay Sales Corp., 282

Calculating Machines
Burroughs Adding Machine Co., 401-404
Remington Rand Inc., 369-375

Calipers
Brown & Sharpe Mfg. Co., 526, 527

Cameras, Motion Picture
Bell & Howell Co., 322
DeVry Corp., 323
RCA Mfg. Co., Inc., 329-332
Victor Animatograph Corp., 324

Canned Foods
John Sexton & Co., 463

Carbon Paper
Miller-Bryant-Pierce Co., 342
Underwood Elliott Fisher Co., 398, 399

Card Systems
Art Metal Construction Co., 359-368
Diebold Safe & Lock Co., 379
Remington Rand Inc., 369-375

Cases, Museum & Display
Art Metal Construction Co., 359-368
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Yawman and Erbe Mfg. Co., 376

Cash Registers
Remington Rand Inc., 369-375

Casters
Bassick Co., 338; 444
Faultless Caster Corp., 446

Caulking Compounds
Athey Co., 138, 139
A. C. Horn Co., 605
United Laboratories, Inc., 200, 201

Ceilings, Steel
Milcor Steel Company, 94, 95

Cement
A. C. Horn Co., 605

Cement (Acid-Proof)
Pennsylvania Salt Manufacturing Co., 280
United States Stoneware Co., 494

Cement Sealers & Finishers
American Crayon Co., 183

Central Heating Systems, Conduit for
American District Steam Co., 90
Ric-Wil Co., 96

Centralized Radio Receiving Equipment
International Business Machines Corp., 122, 123
RCA Mfg. Co., Inc., 329-332
Standard Electric Time Co., 125
Western Electric Co., 334, 335

Ceramic Tile
Mosaic Tile Co., 73

Chair Glides (Noiseless) & Casters
Bassick Co., 338; 444
Buckeye Glide Co., Inc., 445
Faultless Caster Corp., 446

Chairs, Assembly, Lecture Room, etc.
General Fireproofing Co., 382, 383; 486, 487
Heywood-Wakefield Co., 336
Theodor Kundtz Co., 337
L. & J. G. Stickley, Inc., 441

Chairs, Folding & Portable
General Fireproofing Co., 382, 383; 486, 487
Theodor Kundtz Co., 337
Lyon Metal Products, Inc., 386, 387
Stewart Iron Works Co., 233

Chairs, Metal
Doehler Metal Furniture Co., Inc., 437-440
General Fireproofing Co., 382, 383; 486, 487
Lyon Metal Products, Inc., 386, 387

Chairs, Office & Library
Art Metal Construction Co., 359-368
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
L. & J. G. Stickley, Inc., 441

Chairs, Tablet Arm
General Fireproofing Co., 382, 383; 486, 487
Theodor Kundtz Co., 337
Heywood-Wakefield Co., 336

Charging Desks
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Remington Rand Inc., 369-375

Chases, Type
American Type Founders, 533-536

Chemical Apparatus
F. J. Stokes Machine Co., 498

Child Accounting Records
Art Metal Construction Co., 359-368
Remington Rand Inc., 369-375

Chisels
Stanley Tools, 521

Chlorine Control Apparatus
Mathieson Alkali Works, 279
Wallace & Tiernan Co., Inc., 281

Chlorine, Liquid
Mathieson Alkali Works, 279
Pennsylvania Salt Mfg. Co., 280

Classroom Seating
Heywood-Wakefield Co., 336
Theodor Kundtz Co., 337

Clay Tile, Structural
National Fireproofing Corp., 76

Cleaners, Swimming Pool
Spencer Turbine Co., 199

Cleaners, Vacuum
Invincible Vacuum Cleaner Mfg. Co., 198
Spencer Turbine Co., 199
B. F. Sturtevant Co., 99

Cleaning Compounds
J. B. Ford Co., 185; 459
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
A. C. Horn Co., 605
Midland Chemical Laboratories, 192-194
Pennsylvania Salt Manufacturing Co., 280
Selig Co., 190, 191
United Laboratories, Inc., 200, 201

Climbing Apparatus
Mitchell Manufacturing Co., 286
Recreation Equipment Co., 287

Clocks, Electric Program
Cincinnati Time Recorder Co., 124
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125
Warren Telechron Co., 126

Clocks, Tower & Outside
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125
Warren Telechron Co., 126

Coal Hole Covers, Safety
American Abrasive Metals Co., 71

Coffee
John Sexton & Co., 463

Coffee Urns
Aluminum Cooking Utensil Co., 454
Corning Glass Works, 110-113; 455
Nathan Straus-Duparquet, Inc., 461

Color Lighting (see Lighting Equipment & Supplies)

Colorimeters
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Combination Locks
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Commercial & Typewriter Tables
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Doehler Metal Furniture Co., Inc., 437-440
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Remington Rand Inc., 369-375

Composing Sticks
American Type Founders, 533-536

Concrete Acceleration
Columbia Alkali Corp., 226
Solvay Sales Corp., 282

Concrete Finishes
Asphalt Products Co., Inc., 184

Condensing Units
Westinghouse Electric & Mfg. Co., 120; 274; 453

Condiments
John Sexton & Co., 463

Conduit
American District Steam Co., 90
Ric-Wil Co., 96

Controlled Reading
American Optical Co., 328

Controllers, Temperature
Powers Regulator Co., 100, 101
Warren Webster & Co., 103

Cooking Equipment
Aluminum Cooking Utensil Co., 454
G. S. Blodgett Co., Inc., 447
Carbide and Carbon Chemicals Corp., 449
Cleveland Range Co., 450
Corning Glass Works, 110-113; 455
Edison General Electric Appliance Co., 451
Albert Pick Co., Inc., 460
Standard Gas Equipment Corp., 452
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Cork Carpet
Congoleum-Nairn, Inc., 60, 61

Costumers
Security Steel Equipment Corp., 390, 391

Counterbalance Rigging, Stage
J. R. Clancy Inc., 340

Counters, Sectional
Art Metal Construction Co., 359-368
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Lyon Metal Products, Inc., 386, 387
Security Steel Equipment Corp., 390, 391

Cove Base
Thos. Moulding Floor Mfg. Co., 62

Cove, Metal
Milcor Steel Company, 94, 95

Cream Whippers
Hobart Mfg. Co., 456

Curtain Hoist and Track
J. R. Clancy Inc., 340
I. Weiss and Sons, Inc., 341

Curtains, Stage
I. Weiss and Sons, Inc., 341

Cutters, Food
Hobart Manufacturing Co., 456
John E. Smith's Sons Co., 457

Cutters, Gear & Milling
Brown & Sharpe Mfg. Co., 526, 527

Cyclorama Settings
I. Weiss and Sons, Inc., 341

Damper Controls
W. F. Hirschman Co., Inc., 102

Dampproofing
Barrett Co., 85
A. C. Horn Co., 605
United Laboratories, Inc., 200, 201

Delineascopes
Spencer Lens Co., 326; 496

Desk Refinishing
A. C. Horn Co., 605

Desks
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Doehler Metal Furniture Co., 437-440
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Heywood-Wakefield Co., 336
Theodor Kundtz Co., 337
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
L. & J. G. Stickley, Inc., 441
Yawman and Erbe Mfg. Co., 376

Detergents
J. B. Ford Co., 185; 459

Dictating Machines
Dictaphone Sales Corp., 394, 395
Ediphone, 396, 397

Directories
Tablet & Ticket Co., 464

Dishwasher Cleanser
Mathieson Alkali Works, 279
Pennsylvania Salt Manufacturing Co., 280

Dishwashing Machines
J. B. Ford Co., 185; 459
Hobart Mfg. Co., 456
Nathan Straus-Duparquet, Inc., 461

Disinfectants
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
Mathieson Alkali Works, 279
Midland Chemical Laboratories, Inc., 192-194
Pennsylvania Salt Mfg. Co., 280
Selig Co., 190, 191

Display Cases (see Cases)

Display Rail
Andrew Hoffman, 594

Distilling Apparatus
F. J. Stokes Machine Co., 498

Diving Boards & Fulcrum Equipment
American Playground Device Co., 284, 285
Everwear Manufacturing Co., 283
Mitchell Manufacturing Co., 286
Recreation Equipment Co., 287

Domestic Science Equipment
Art Metal Construction Co., 359-368
Doehler Metal Furniture Co., 437-440
Excel Metal Cabinet Co., Inc., 427-433
Kewaunee Mfg. Co., 488
Laboratory Furniture Co., 489
Mutschler Brothers Co., 436
Albert Pick Co., Inc., 460
St. Charles Manufacturing Co., 434, 435
Standard Gas Equipment Corp., 452
L. & J. G. Stickley, Inc., 441
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Door Closers
Norton Door Closer Co., 148
Norton Lasier Co., 149

Door Locks
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Door Saddles & Sills, Safety
Accurate Metal Weather Strip Co., 137
Alberene Stone Corp. of Va., 490
American Abrasive Metals Co., 71
American Mason Safety Tread Co., 70
Wooster Products, Inc., 72

Doors and Trim, Metal
Republic Steel Corp., 91; 448

Doors, Fire Resistive Vault
Diebold Safe & Lock Co., 379

Doors, Steel Rolling, Fire or Service
Cornell Iron Works, Inc., 134
Kinnear Mfg. Co., 135

Dormitory Cabinets
Miami Cabinet Div., Philip Carey Co., 442, 443

Dormitory Furniture
Doehler Metal Furniture Co., 437-440
L. & J. G. Stickley, Inc., 441

Drafting Room Equipment
Wickes Brothers, 538

Drain Cleaning Tools
Allan J. Coleman, 202

Drain Foundation Tile
Ric-Wil Co., 96

Drainage Pipe & Fittings
General Ceramics Co., 491
Maurice A. Knight, 492
Pacific Foundry Co., Ltd., 493
United States Stoneware Co., 494

Drains, Roof
Barrett Co., 85

Draperies & Curtains
I. Weiss and Sons, Inc., 341

Driers, Blueprint
Wickes Brothers, 538

Driers, Laboratory
F. J. Stokes Machine Co., 498

Drill Presses
Boice-Crane Co., 528
Delta Mfg. Co., 529
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Drill Stands
Stanley Electric Tool Div., Stanley Works, 520.

Drills
Stanley Electric Tool Div., Stanley Works, 520.

Drinking Fountains
Bradley Wash Fountain Co., 107
Crane Co., 106
Halsey W. Taylor Co., 108

Drying Racks
American Type Founders, 533-536

Ducts, Acid Fume
Pacific Foundry Co., Ltd., 493

Duplicators, Gelatin
Ditto, Inc., 405
L. C. Smith & Corona Typewriters, Inc., 400

Duplicators, Liquid
Ditto, Inc., 405

Duplicators, Stencil
Ditto, Inc., 405

Duplicator Supplies
Ditto, Inc., 405
Miller-Bryant-Pierce Co., 342
L. C. Smith & Corona Typewriters, Inc., 400

Dust Laying
Columbia Alkali Corp., 226
Solvay Sales Corp., 282

Earthenware, Acid-Resisting (see Stoneware)

Educational Talking Pictures (see Teaching Films)

Egg Boilers, Automatic
Edison General Electric Appliance Co., 451

Ejectors, Laboratory Fume
Pacific Foundry Co., Ltd., 493

Electric Floor Sanding Machines
Lincoln-Schlueter Floor Machinery Co., Inc., 196

Electric Floor Scrubbing-Polishing Machines
General Floorcraft, Inc., 195
Hillyard Sales Co., 186, 187
Lincoln-Schlueter Floor Machinery Co., Inc., 196
Midland Chemical Laboratories, Inc., 192-194
G. H. Tennant Co., 197

Electric Scoreboards & Timers
Fair-Play Co., 275
International Business Machines Corp., 122, 123
Warren Telechron Co., 126

Electric Storage Batteries
Thomas A. Edison, Inc., 506
Electric Storage Battery Co., 133; 507

Electric Tools
Stanley Electric Tool Div., Stanley Works, 520

Electrical Measuring Instruments
General Electric Co., 116; 273; 320; 499-502
General Radio Co., 503
Rawson Electrical Instrument Co., 504
Weston Electrical Instrument Corp., 121; 505

Electrolytic Chlorine Cells (Lab. Size)
United States Stoneware Co., 494

Elevator Door Sills, Safety
American Abrasive Metals Co., 71
American Mason Safety Tread Co., 70
Wooster Products, Inc., 72

Enamels
A. C. Horn Co., 605

Enclosures, Elevators, Steel
Republic Steel Corp., 91; 448

Evergreens
Stumpp & Walter Co., 218

Exit-Alarm Systems
Gamewell Co., 130, 131

Exit Signs
Capitol Stage Lighting Co., 339

Expansion Joint Material
Barrett Co., 85
Philip Carey Co., Inc., 86
A. C. Horn Co., 605
Johns-Manville, 82, 83
Servicised Products Corp., 65

Fans
B. F. Sturtevant Co., 99

Fans, Exhaust
General Ceramics Co., 491
Maurice A. Knight, 492
Pacific Foundry Co., Ltd., 493
B. F. Sturtevant Co., 99
United States Stoneware Co., 494

Felts, Roofing
Barrett Co., 85
Philip Carey Co., Inc., 86
Ruberoid Co., 87
United Laboratories, Inc., 200, 201

Fencing, Iron and Chain Link
Anchor Post Fence Co., 228
Continental Steel Corp., 229
Copperweld Steel Co., 230
Cyclone Fence Co., 231
W. F. Robertson Steel & Iron Co., 232
Stewart Iron Works Co., 233
Wickwire Spencer Steel Co., 234

Fencing, Non-Rusting
Copperweld Steel Co., 230

Fertilizers
Stumpp & Walter Co., 218

Field Houses
Lamella Roof Syndicate, Inc., 88

Figures (Gummed Paper) for Charts, etc.
Tablet & Ticket Co., 464

Filing Equipment
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Diebold Safe & Lock Co., 379
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Lyon Metal Products, Inc., 386, 387
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Yawman and Erbe Mfg. Co., 376

Filing Systems
Art Metal Construction Co., 359-368
Diebold Safe & Lock Co., 379
General Fireproofing Co., 382, 383; 486, 487
Remington Rand Inc., 369-375
Yawman and Erbe Mfg. Co., 376

Film Cabinets (see Cabinets, Special)

Films
Bell & Howell Co., 322
Erpi Classroom Films, Inc., 315-319
General Electric Co., 116; 273; 320; 499-502
Spencer Lens Co., 326; 496

Filmslide Projectors
Spencer Lens Co., 326; 496

Filter Paper
Eaton-Dikeman Co., 497

Filters, Suction, Acid Resisting
General Ceramics Co., 491
Maurice A. Knight, 492
United States Stoneware Co., 494

Filters, Water (see Water Filters)

Fire Alarm Systems
American District Telegraph Co., 128, 129
Cincinnati Time Recorder Co., 124
Gamewell Co., 130, 131
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125
Thomas-Smith Co., 127

Fire Doors
Cornell Iron Works, Inc., 134
Kinnear Mfg. Co., 135

Fire Extinguishers, Automatic
Rockwood Sprinkler Co., 132

Fire Protection Equipment
Rockwood Sprinkler Co., 132

Fittings & Valves
Crane Co., 106
Speakman Co., 104, 105

Flagpoles
John E. Lingo & Son, Inc., 152
Stewart Iron Works Co., 233
Traffic & Street Sign Co., 151

Flashing, Roof
Barrett Co., 85
Revere Copper & Brass Inc., 93

Floodlighting
American Playground Device Co., 284, 285
Anchor Post Fence Co., 228
Benjamin Electric Mfg. Co., 270, 271
Capitol Stage Lighting Co., 339
Crouse-Hinds, 272
General Electric Co., 116; 273; 320; 499-502
Graybar Electric Co., 333
I. Weiss and Sons, Inc., 341
Westinghouse Elec. & Mfg. Co., 120; 274; 453

Floor Brushes
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
Selig Co., 190, 191

Floor Covering
Congoleum-Nairn, Inc., 60, 61

Floor Covering, Mastic
United Laboratories, Inc., 200, 201

Floor Finishes & Dressings
American Crayon Co., 183
Asphalt Products Co., Inc., 184
General Floorcraft, Inc., 195
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
A. C. Horn Co., 605
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191
United Laboratories, Inc., 200, 201

Floor Machines (Scrubbing-Polishing)
General Floorcraft, Inc., 195
Hillyard Sales Co., 186, 187
Lincoln-Schlueter Floor Machinery Co., Inc., 196
Midland Chemical Laboratories, Inc., 192-194
G. H. Tennant Co., 197

Floor Maintenance Systems
G. H. Tennant Co., 197

Floor Paints
Asphalt Products Co., Inc., 184
A. C. Horn Co., 605
United Laboratories, Inc., 200, 201

Floor Plates, Safety
American Abrasive Metals Co., 71
American Mason Safety Tread Co., 70
Wooster Products Inc., 72

Floor Repair Materials
Asphalt Products Co., Inc., 184

Floor Repairing, Concrete
United Laboratories, Inc., 200, 201

Floor Sanding Equipment (see Sanders, Floor)

Flooring
Alberene Stone Corp. of Va., 490
American Tile & Rubber Co., 63
Congoleum-Nairn, Inc., 60, 61
Goodyear Tire and Rubber Co., Inc., 64
Jennison-Wright Co., 66, 67
Johns-Manville, 82, 83
Maple Flooring Mfrs. Assn., 69
Mosaic Tile Co., 73
Thos. Moulding Floor Mfg. Co., 62
National Fireproofing Corp., 76
National Terrazzo & Mosaic Assn., 74, 75
Servicised Products Corp., 125
Structural Slate Co., 145
Tile-Tex Co., 56-59
United Laboratories, Inc., 200, 201
Wright Rubber Products Co., 68

Flower Seeds
Stumpp & Walter Co., 218

Flush Valves
Crane Co., 106
Speakman Co., 104, 105

Flushers, Hydraulic
Allan J. Coleman, 202

Folding Bleachers
Fred Medart Manufacturing Co., 276; 392
Universal Bleacher Co., 278

Folding Chairs (see Chairs, Folding)

Folding Gates (see Gates, Folding)

Food Choppers
Hobart Mfg. Co., 456
John E. Smith's Sons Co., 457

Food Cutters
Hobart Mfg. Co., 456
John E. Smith's Sons Co., 457

Food Products
John Sexton & Co., 463

Foot Baths
American Playground Device Co., 284, 285
Hillyard Sales Co., 186, 187

Foot Fountains
Bradley Washfountain Co., 107

Footlights
Capitol Stage Lighting Co., 339

Fountains, Drinking
Bradley Washfountain Co., 107
Crane Co., 106
Halsey W. Taylor Co., 108

Frames, Blackboard & Bulletin Board
Milcor Steel Company, 94, 95

Fruits, Canned & Dried
John Sexton & Co., 463

Fruit Trees
Stumpp & Walter Co., 218

Fume Hoods, Laboratory
Alberene Stone Corp. of Va., 490
General Fireproofing Co., 382, 383; 486, 487
Kewaunee Mfg. Co., 488
Laboratory Furniture Co., 489
Republic Steel Corp., 91; 448

Furnaces, Gas
Peck, Stow & Wilcox Co., 532

Furniture, Cafeteria
Kewaunee Mfg. Co., 488
Mutschler Brothers Co., 436
Albert Pick Co., Inc., 460
Republic Steel Corp., 91; 448
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Furniture Cups
Faultless Caster Corp., 446

Furniture, Dormitory
Doehler Metal Furniture Co., Inc., 437-440
L. & J. G. Stickley, Inc., 441

Furniture Glides (Noiseless)
Bassick Co., 338; 444
Buckeye Glide Co., Inc., 445
Faultless Caster Corp., 446

Furniture, Home Economics
Excel Metal Cabinet Co., 427-433
Kewaunee Mfg. Co., 488
St. Charles Manufacturing Co., 434, 435

Furniture, Kindergarten
Doehler Metal Furniture Co., Inc., 437-440
Kewaunee Mfg. Co., 488

Furniture, Laboratory & Shop
General Fireproofing Co., 382, 383; 486, 487
Kewaunee Mfg. Co., 488
Laboratory Furniture Co., 489
Lyons Metal Products, Inc., 386, 387
Republic Steel Corp., 91; 448
Yawman and Erbe Mfg. Co., 376

Furniture, Office & Library
Art Metal Construction Co., 359-368
Dictaphone Sales Corp., 394, 395
Diebold Safe & Lock Co., 379
Doehler Metal Furniture Co., Inc., 437-440
Ediphone, 396, 397
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Lyon Metal Products, Inc., 386, 387
Metal Office Furniture Co., 388, 389
Mutschler Brothers Co., 436
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391

Furniture, School
Doehler Metal Furniture Co., 437-440
General Fireproofing Co., 382, 383; 486, 487
Heywood-Wakefield Co., 336
Kewaunee Mfg. Co., 488
Theodor Kundtz Co., 337
Mutschler Brothers Co., 436
L. & J. G. Stickley, Inc., 441

Fused Soda Ash
Mathieson Alkali Works, 279

Fuses, Renewable
General Electric Co., 116; 273; 320; 499-502

Gages
Brown & Sharpe Mfg. Co., 526, 527

Galvanized Pipe
Republic Steel Corp., 91; 448

Galvanometers
General Electric Co., 116; 273; 320; 490-502
Weston Electrical Instrument Corp., 121; 505

Garbage & Waste Incinerators
Kerner Incinerator Co., 109
Selig Co., 190, 191

Garden & Greenhouse Supplies
Stumpp & Walter Co., 218

Gas, Compressed, for Kitchen and Laboratory
Carbide and Carbon Chemicals Corp., 449

Gas Ranges and Ovens
Carbide and Carbon Chemicals Corp., 449
Standard Gas Equipment Corp., 452

Gates, Folding
Stewart Iron Works Co., 233
Wickwire Spencer Steel Co., 234

Gates, Iron & Wire
Anchor Post Fence Co., 228
Continental Steel Corp., 229
W. F. Robertson Steel & Iron Co., 232
Stewart Iron Works Co., 233
Wickwire Spencer Steel Co., 234

Generating Sets, Emergency
Stanley & Patterson, 92

Generators
General Electric Co., 116; 273; 320; 490-502

Glass Blackboard
Blue Ridge Glass Corp., 142, 143
New York Silicate Book Slate Co., Inc., 147

Glass, Optical, Prismatic, Colored, etc.
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Glass, Safety
American Window Glass Co., 553

Glassware, Laboratory, Cooking, etc.
Corning Glass Works, 110-113; 455
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Glassware, Lighting
Chase Brass & Copper Co., Inc., 114, 115
Corning Glass Works, 110-113; 455
Gleason-Tiebout Glass Co., 118
Graybar Electric Co., 333
Holophane Co., Inc., 117
Westinghouse Electric & Mfg. Co., 120; 274; 453

Glides (Adjustable, Noiseless)
Bassick Co., 338; 444
Buckeye Glide Co., Inc., 445
Faultless Caster Corp., 446

Globes & Glassware, Lighting
Chase Brass & Copper Co., Inc., 114, 115
Corning Glass Works, 110-113; 455
Gleason-Tiebout Glass Co., 118
Holophane Co., Inc., 117
F. W. Wakefield Brass Co., 119

Glue Pots, Electric
Oliver Machinery Co., 530

Golf Course Equipment
Coldwell Lawn Mower Co., 221
Gravely Manufacturing Co., 220
Jacobsen Mfg. Co., 222
Moto-Mower Co., 223
Stumpp & Walter Co., 218
Toro Manufacturing Co., 224

Golf Course Seeds & Supplies
Stumpp & Walter Co., 218

Gongs, Fire Alarm
American District Telegraph Co., 128, 129
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125
Thomas-Smith Co., 127

Grandstands
Pittsburgh-Des Moines Steel Co., 277
Universal Bleacher Co., 278

Grass Seed
Stumpp & Walter Co., 218

Grilles, Sliding
Cornell Iron Works, Inc., 134

Grills & Griddles, Electric
Edison General Electric Appliance Co., Inc., 451

Grilles, Metal Rolling
Cornell Iron Works, Inc., 134
Kinnear Mfg. Co., 135

Grinders
Brown & Sharpe Mfg. Co., 526, 527
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Stanley Electric Tool Div., Stanley Works, 520
Walker-Turner Inc., 522, 523
Yates-American Machine Co., 524, 525

Groceries
John Sexton & Co., 463

Guards, Wire Bell
Thomas-Smith Co., 127

Gummed Paper Letters & Figures
Tablet & Ticket Co., 464

Gymnasium Bleachers, Folding
Fred Medart Manufacturing Co., 276; 392
Universal Bleacher Co., 278

Gymnasium Equipment
American Playground Device Co., 284, 285
Fred Medart Manufacturing Co., 276; 392

Gymnasium Floor Maintenance
American Crayon Co., 183
Hillyard Sales Co., 186, 187
J. I. Holcomb Co., 188, 189
A. C. Horn Co., 605
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191

Gymnasium Flooring
Congoleum-Nairn, Inc., 60, 61
Jennison-Wright Co., 66, 67
Maple Flooring Mfrs. Assn., 69

Gymnasium Lighting (see Lighting Equipment)

Gymnasium Lockers (see Lockers)

Hammers
Stanley Tools, 521

Hand Drills
Stanley Tools, 521

Hand Lawn Mowers (see Lawn Mowers)

Hardwood Flooring
Maple Flooring Mfrs. Assn., 69

Health Records
Art Metal Construction Co., 359-368

Hearing Aids
Western Electric Co., 334, 335

Heat Control Systems
W. F. Hirschman Co., Inc., 102
Powers Regulator Co., 100, 101
Warren Webster & Co., 103

Heating Equipment
American District Steam Co., 90
Nash Engineering Co., 97
John J. Nesbitt, Inc., 98
B. F. Sturtevant Co., 99

Heating Materials
Milcor Steel Company, 94, 95

Heating, Vacuum System
Warren Webster & Co., 103

Hedges
Cole Nursery Co., 219

Herbarium Cases
Globe-Wernicke Co., 384, 385

Homemaking Furniture & Equipment
Art Metal Construction Co., 359-368
Excel Metal Cabinet Co., Inc., 427-433
Kewaunee Mfg. Co., 488
St. Charles Manufacturing Co., 434, 435

Household Appliances
Graybar Electric Co., 333
Albert Pick Co., Inc., 460
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

H_2S Generators
General Ceramics Co., 491
Maurice A. Knight, 492
United States Stoneware Co., 494

Humidity Control Apparatus
Powers Regulator Co., 100, 101

Hypochlorite
Mathieson Alkali Works, 279
Pennsylvania Salt Mfg. Co., 280

Ice Removal
Columbia Alkali Corp., 226
Solvay Sales Corp., 282

Illumination Control
General Electric Co., 116; 273; 320; 499-502
Weston Electrical Instrument Corp., 121; 505

Implements, Garden & Farm
Stumpp & Walter Co., 218

Imposing Tables
American Type Founders, 533-536

Incinerators for Garbage & Waste Disposal
Kerner Incinerator Co., 109
Selig Co., 190, 191

Indexes and Card Index Systems
Art Metal Construction Co., 359-368
Diebold Safe & Lock Co., 379
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Remington Rand Inc., 369-375
Yawman and Erbe Mfg. Co., 376

Infirmary Equipment
Doehler Metal Furniture Co., 437-440

Inks, Printing
American Type Founders, 533-536

Inks, Stencil
Miller-Bryant-Pierce Co., 342

Insecticides
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191
Stumpp & Walter Co., 218

Instruments for Reading Instruction
American Optical Co., 328

Instruments, Portable, Electrical
General Electric Co., 116; 273; 320; 499-502
General Radio Co., 503
Rawson Electrical Instrument Co., 504
Weston Electrical Instrument Corp., 121; 505

Instruments, Switchboard
Weston Electrical Instrument Corp., 121; 505

Insulation
American District Steam Co., 90
Philip Carey Co., Inc., 86
Celotex Corp., 77-81
Johns-Manville, 82, 83
Ruberoid Co., 87
Wood Conversion Co., 84

Insulation, Conduit
American District Steam Co., 90
Ric-Wil Co., 96

Integral Waterproofing
A. C. Horn Co., 605

Inter-Phones
Graybar Electric Co., 333
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125

Iron, Acid Resisting
Pacific Foundry Co., Ltd., 493

Iron Pipe
Republic Steel Corp., 91; 448

Janitors' Supplies
J. B. Ford Co., 185; 459
General Floorcraft, Inc., 195
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
A. C. Horn Co., 605
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191

Jars & Containers, Stoneware
General Ceramics Co., 491
Maurice A. Knight, 492
United States Stoneware Co., 494

Jig Saws
Boice-Crane Co., 528
Oliver Machinery Co., 530
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Jointers, Bench Hand
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Walker-Turner Co., 522, 523
Yates-American Machine Co., 524, 525

Joints, Expansion
American District Steam Co., 90
Philip Carey Co., Inc., 86

Kettles, Fry
Edison General Electric Appliance Co., 451

Kettles, Laboratory
F. J. Stokes Machine Co., 498

Kettles, Steam Jacketed
Aluminum Cooking Utensil Co., 454

Key Cabinets
Durabilt Steel Locker Co., 380, 381
P. O. Moore, Inc., 153-155

Key Control Systems
P. O. Moore, Inc., 153-155

Kindergarten Supplies
Kewaunee Mfg. Co., 488

Kitchen Equipment
Aluminum Cooking Utensil Co., 454
G. S. Blodgett Co., Inc., 447
Carbide and Carbon Chemicals Corp., 449
Cleveland Range Co., 450
Crucible Steel Co. of America, 452a, 452b
Edison General Electric Appliance Co., 451
Excel Metal Cabinet Co., Inc., 427-433
Hobart Mfg. Co., 456
Mutschler Brothers Co., 436
Albert Pick Co., Inc., 460
Republic Steel Corp., 91; 448
St. Charles Manufacturing Co., 434, 435
John E. Smith's Sons Co., 457
Standard Gas Equipment Corp., 452
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Labels, Gummed
Tablet & Ticket Co., 464

Laboratory Equipment
Alberene Stone Corp. of Va., 490
Bausch & Lomb Optical Co., 325; 495
Carbide and Carbon Chemicals Corp., 449
General Ceramics Co., 491
General Electric Co., 116; 273; 320; 499-502
General Fireproofing Co., 382, 383; 486, 487
General Radio Co., 503
Kewaunee Mfg. Co., 488
Maurice A. Knight, 492
Laboratory Furniture Co., 489
Metal Office Furniture Co., 388, 389
Pacific Foundry Co., Ltd., 493
Republic Steel Corp., 91; 448
Spencer Lens Co., 326; 496
Standard Electric Time Co., 125
F. J. Stokes Machine Co., 498
United States Stoneware Co., 494

Laboratory Furniture
General Fireproofing Co., 382, 383; 486, 487
Kewaunee Mfg. Co., 488
Laboratory Furniture Co., 489
Yawman and Erbe Mfg. Co., 376

Laboratory Instruments & Apparatus
Bausch & Lomb Optical Co., 325; 495
Eaton-Dikeman Co., 497
General Electric Co., 116; 273; 320; 499-502
General Radio Co., 503
Rawson Electrical Instrument Co., 504
Spencer Lens Co., 326; 496
Weston Electrical Instrument Corp., 121; 505

Laboratory Pipe, Acid Resisting
General Ceramics Co., 491
Maurice A. Knight, 492
Pacific Foundry Co., Ltd., 493
United States Stoneware Co., 494

Laboratory Storage Batteries
Thomas A. Edison, Inc., 506
Electric Storage Battery Co., 133; 507

Lamps
Graybar Electric Co., 333
Westinghouse Electric & Mfg. Co., 120; 274; 453

Lanterns
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Lath, Metal
Milcor Steel Company, 94, 95

Lathes, Metal Working
Delta Mfg. Co., 529
Oliver Machinery Co., 530
South Bend Lathe Works, 531

Lathes, Woodworking
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Walker-Turner Co., 522, 523
Yates-American Machine Co., 524, 525

Lavatories & Lavatory Fixtures
Bradley Washfountain Co., 107
Crane Co., 106
Speakman Co., 104, 105

Lawn Mowers & Trimmers
Coldwell Lawn Mower Co., 221
Gravely Manufacturing Co., 220
Jacobsen Mfg. Co., 222
Moto-Mower Company, 223
Toro Manufacturing Co., 224
Whirlwind Lawn Mowers Sales Corp., 225

Lawn Sweepers
Moto-Mower Co., 223

Lawns, Seeds for
Stumpp & Walter Co., 218

Lenses (Photographic)
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Letters, Changeable
Tablet & Ticket Co., 464

Library Equipment
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Doehler Metal Furniture Co., Inc., 437-440
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Lyon Metal Products, Inc., 386, 387
Metal Office Furniture Co., 388, 389
Mutschler Brothers Co., 436
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Yawman and Erbe Mfg. Co., 376

Library Furniture (see Furniture)

Library Supplies
Globe-Wernicke Co., 384, 385

Light Measuring Instruments
Weston Electrical Instrument Corp., 121; 505

Light-Proof Shades & Materials
Athey Co., 138, 139
Columbus Coated Fabrics Corp., 140

Lighting Control, Photoelectric
General Electric Co., 116; 273; 320; 499-502
Weston Electrical Instrument Corp., 121; 505

Lighting Equipment and Supplies
Benjamin Electric Mfg. Co., 270, 271
Chase Brass and Copper Co., Inc., 114, 115
Corning Glass Works, 110-113; 455
Crouse-Hinds, 272
General Electric Co., 116; 273; 320; 499-502
Gleason-Tiebout Glass Co., 118
Graybar Electric Co., 333
Holophane Co., Inc., 117
F. W. Wakefield Brass Co., 119
Westinghouse Electric & Mfg. Co., 120; 274; 453

Lighting Fixtures
Chase Brass and Copper Co., Inc., 114, 115
Gleason-Tiebout Glass Co., 118
Graybar Electric Co., 333
Holophane Co., Inc., 117
F. W. Wakefield Brass Co., 119
Westinghouse Electric & Mfg. Co., 120; 274; 453

Lighting Glassware
Chase Brass and Copper Co., Inc., 114, 115
Corning Glass Works, 110-113; 455
Gleason-Tiebout Glass Co., 118
Holophane Co., Inc., 117
F. W. Wakefield Brass Co., 119

Lighting, Gymnasium
Benjamin Electric Mfg. Co., 270, 271

Lighting, Stage
Capitol Stage Lighting Co., 339
Graybar Electric Co., 333
I. Weiss and Sons, Inc., 341

Lighting Standards
Graybar Electric Co., 333

Lighting Systems, Emergency
Electric Storage Battery Co., 133; 507
Stanley & Patterson, 92

Linoleum
Congoleum-Nairn, Inc., 60, 61

Liquid Soaps
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191

Lockers, Steel
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Diebold Safe & Lock Co., 379
Durabilt Steel Locker Co., 380, 381
General Fireproofing Co., 382, 383; 486, 487
Lyon Metal Products, Inc., 386, 387
Fred Medart Manufacturing Co., 276; 392
Metal Office Furniture Company, 388, 389
Remington Rand Inc., 369-375
Worley & Co., 393

ANDREW HOFFMAN

5034–5038 South State Street, Chicago, Ill.

THE IDEAL MAP AND DISPLAY RAIL

Used in Schoolrooms, Offices, Conference Rooms, Hospitals

The Andrew Hoffman display rail is applied to the walls on old or new trim at a convenient height, for the purpose of hanging map cases, maps, charts, posters, bulletins, drawings, and things of a similar nature.

Display rail 15¢ per foot.
Solid bronze hook 10¢ each.
Combination bronze hook 7¢ each.
Spring clip 2¢ each.
Average shipping weight of the above items is 5 oz. per foot.

Description

This display rail consists of a substantial steel rail of special channel section, in which slide hooks and clips. In schoolrooms, the rail is screwed to the trim at the top of the blackboards. In rooms without blackboards, it is screwed at a convenient height to trim, grounds, or directly to the wall. The screws, which we furnish, are closely spaced for maximum strength.

To provide for the most efficient hanging of various objects, there are three types of hooks: one of very strong one-piece bronze construction that will support the heaviest map cases without turning or twisting—furnished, one to each 5 ft. of rail; and a lighter spring-steel combination hook and spring clip that supports lighter maps, charts, posters, bulletins, etc.—furnished, one to each 1½ ft. of rail.

Either hook may be removed from the rail by lifting it out through the notch. The bodies of hooks are **inside** rail; consequently hooks slide freely without interference, and appearance is neater. Additional hooks may be inserted through the notches.

Available also is a spring fastener which is inexpensive, and can be easily inserted, moved along the rail or taken out.

Sizes

The display rail comes in sections 30 in. long. It is ⅞ in. wide and $\frac{5}{16}$ in. deep.

If the rail is to be mortised, the mortise should be only ¼ in. deep to prevent hooks from scratching the trim.

Finish

The display rail is finished in statuary enamel to harmonize with the trim customarily used.

Advantages

This display rail is designed and built to give a lifetime of satisfactory and trouble-free service.

Thumb tacks and cork pads are eliminated by the use of the combination hook and spring clip. When the spring hook is lifted, the poster, etc., may be placed beneath, where it is held firmly, yet without injury, by spring pressure, which is, we believe, the only permanently satisfactory method.

The rail may be mortised or rabbeted in any position on the face of the trim or may be screwed to the surface. The rail should be mortised in a groove to attain the most attractive appearance. A mortised rail blends into the ensemble so completely as to be very inconspicuous. See the optional positions in small drawing.

The sections of the rail are self-aligning, through the use of the dovetail joint, thus assuring the smooth passage of the hooks and clips. Being firmly fastened with screws, the rail cannot pull loose.

It is extremely versatile in its use: the two different hooks provide for the display or hanging of anything from a sheet of paper to a map case weighing 100 lbs.

SPECIFICATIONS

The contractor shall furnish and install above all blackboard spaces Ideal Map and Display Rail equipped with hooks or spring clips. The Display Rail shall be securely fastened to blackboard trim or grounds or directly to wall in accordance with the manufacturer's instructions.

Locks, Combination
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Locks, Key
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Loose Leaf Books & Systems
Remington Rand Inc., 369-375

Machines, Milling, Grinding, etc.
Brown & Sharpe Mfg. Co., 526, 527

Magnifiers
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Manual Training Equipment
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Brown & Sharpe Mfg. Co., 526, 527
Delta Mfg. Co., 529
Duro Metal Products Co., 586
New Britain Machine Co., 537
Oliver Machinery Co., 530
Peck, Stow & Wilcox Co., 532
South Bend Lathe Works, 531
Stanley Electric Tool Div., Stanley Works, 520
Stanley Tools, 521
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Map Rail
Andrew Hoffman, 594

Mats, Filter
Eaton-Dikeman Co., 497

Mats, Gymnasium
American Playground Device Co., 284, 285
Everwear Mfg. Co., 283

Matting, Rubber
American Playground Device Co., 284, 285
American Tile & Rubber Co., 63
J. I. Holcomb Mfg. Co., 188, 189
Servicised Products Corp., 65

Mattresses
Doehler Metal Furniture Co., Inc., 437-440

Meat Choppers
John E. Smith's Sons Co., 457

Medals, Bronze
General Bronze Corp., 136

Memorial Plates
General Bronze Corp., 136
James H. Matthews & Co., 150

Menu Boards
Tablet & Ticket Co., 464

Metal Spinning Lathes
Oliver Machinery Co., 530

Metal Trim
Milcor Steel Company, 94, 95

Metal Weather Strips
Accurate Metal Weather Strip Co., 137
Athey Co., 138, 139

Meters, Electric
General Electric Co., 116; 273; 320; 499-502
General Radio Co., 503
Rawson Electrical Instrument Co., 504
Weston Electrical Instrument Corp., 121; 505

Meters, Steam Condensation
American District Steam Co., 90

Micrometers
Brown & Sharpe Mfg. Co., 526, 527

Micro-Projectors
Bausch & Lomb Optical Co., 325; 495

Microscopes & Accessories
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Milling Machines
Brown & Sharpe Mfg. Co., 526, 527

Mills, Coffee & Spice
Hobart Mfg. Co., 456

Mills, Jar
F. J. Stokes Machine Co., 498
United States Stoneware Co., 494

Mitre Boxes
Stanley Tools, 521

Mixers, Food
Hobart Mfg. Co., 456

Mixers, Laboratory
F. J. Stokes Machine Co., 498

Monuments, Bronze
General Bronze Corp., 136

Mops
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189

Mortisers
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Oliver Machinery Co., 530
Yates-American Machine Co., 524, 525

Motion Picture Cameras (see Cameras, Motion Picture)

Motion Picture Films (see Films)

Motion Picture Projectors (see Projectors, 16 mm. and Projectors, 35 mm.)

Motion Picture Screens
Da-Lite Screen Co., Inc., 327
I. Weiss and Sons Inc., 341

Motion Pictures
Erpi Classroom Films Inc., 315-319
General Electric Co., 116; 273; 320; 499-502

Motor Generator Sets
General Electric Co., 116; 273; 320; 499-502

Motors
General Electric Co., 116; 273; 320; 499-502
Graybar Electric Co., 333

Moulding
Wood Conversion Co., 84

Mouldings, Metal
Wooster Products Inc., 72

Music Reproduction Systems
RCA Mfg. Co., Inc., 329-332
Western Electric Co., 334, 335

Name Plates, Desk
Tablet & Ticket Co., 464

Nosing & Edging, Metal
Wooster Products Inc., 72

Nursery Stock
Cole Nursery Co., 219
Stumpp & Walter Co., 218

Office Equipment
Art Metal Construction Co., 359-368
Diebold Safe & Lock Co., 379
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Yawman and Erbe Mfg. Co., 376

Office Machines
Burroughs Adding Machine Co., 401-404
Dictaphone Sales Corp., 394, 395
Ediphone, 396, 397
Remington Rand Inc., 369-375
L. C. Smith & Corona Typewriters, Inc., 400
Underwood Elliott Fisher Co., 398, 399

Optical Measuring Instruments
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Organic Chemicals (see Chemicals)

Oscillators
General Radio Co., 503

Oscillographs
RCA Mfg. Co., Inc., 329-332

Ovens, Electric
Edison General Electric Appliance Co., 451

Ovens, Gas
G. S. Blodgett Co., Inc., 447
Carbide and Carbon Chemicals Corp., 449
Standard Gas Equipment Corp., 452

Padlocks
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Paints & Varnishes
Asphalt Products Co., Inc., 184
Hillyard Sales Co., 186, 187
A. C. Horn Co., 605
United Laboratories, Inc., 200, 201

Paneling
F. E. Berry Jr. & Co., Inc., 601-604
Celotex Corp., 77-81
Wood Conversion Co., 84

Panels, Card Index
Diebold Safe & Lock Co., 379

Panels, Control
General Electric Co., 116; 273; 320; 499-502

Panels, Key
P. O. Moore, Inc., 153-155

Panels, Laboratory
Cincinnati Time Recorder Co., 124
General Electric Co., 116; 273; 320; 499-502
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125

Paper Cutters
American Type Founders, 533-536

Paper, Laboratory Lining
Eaton-Dikeman Co., 497

Papers, Filter
Eaton-Dikeman Co., 497

Partitions
Alberene Stone Corp. of Va., 490
Art Metal Construction Co., 359-368
Bolger-Heller Slate Co., 146
Celotex Corp., 77-81
Structural Slate Co., 145

Partitions, Rolling
Kinnear Mfg. Co., 135

Partitions, Wire
Stewart Iron Works Co., 233

Peelers, Vegetable
Hobart Mfg. Co., 456

Perennials
Stumpp & Walter Co., 218

Phonograph Equipment
RCA Mfg. Co., Inc., 329-332

ANDREW HOFFMAN

5034–5038 South State Street, Chicago, Ill.

THE IDEAL MAP AND DISPLAY RAIL

Used in Schoolrooms, Offices, Conference Rooms, Hospitals

The Andrew Hoffman display rail is applied to the walls on old or new trim at a convenient height, for the purpose of hanging map cases, maps, charts, posters, bulletins, drawings, and things of a similar nature.

Display rail 15¢ per foot.
Solid bronze hook 10¢ each.
Combination bronze hook 7¢ each.
Spring clip 2¢ each.
Average shipping weight of the above items is 5 oz. per foot.

Description

This display rail consists of a substantial steel rail of special channel section, in which slide hooks and clips. In schoolrooms, the rail is screwed to the trim at the top of the blackboards. In rooms without blackboards, it is screwed at a convenient height to trim, grounds, or directly to the wall. The screws, which we furnish, are closely spaced for maximum strength.

To provide for the most efficient hanging of various objects, there are three types of hooks: one of very strong one-piece bronze construction that will support the heaviest map cases without turning or twisting—furnished, one to each 5 ft. of rail; and a lighter spring-steel combination hook and spring clip that supports lighter maps, charts, posters, bulletins, etc.—furnished, one to each 1½ ft. of rail.

Either hook may be removed from the rail by lifting it out through the notch. The bodies of hooks are **inside** rail; consequently hooks slide freely without interference, and appearance is neater. Additional hooks may be inserted through the notches.

Available also is a spring fastener which is inexpensive, and can be easily inserted, moved along the rail or taken out.

Sizes

The display rail comes in sections 30 in. long. It is ⅞ in. wide and 9/16 in. deep.

If the rail is to be mortised, the mortise should be only ¼ in. deep to prevent hooks from scratching the trim.

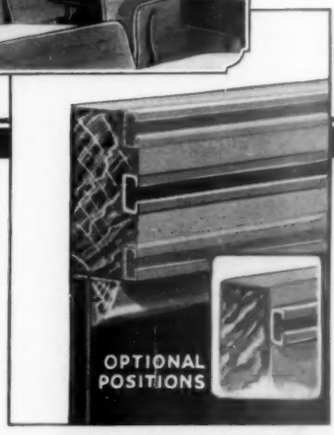
Finish

The display rail is finished in statuary enamel to harmonize with the trim customarily used.

Advantages

This display rail is designed and built to give a lifetime of satisfactory and trouble-free service.

Thumb tacks and cork pads are eliminated by the use of the combination hook and spring clip. When the spring hook is lifted, the poster, etc., may be placed beneath, where it is held firmly, yet without injury, by spring pressure, which is, we believe, the only permanently satisfactory method.



SPECIFICATIONS

The contractor shall furnish and install above all blackboard spaces Ideal Map and Display Rail equipped with hooks or spring clips. The Display Rail shall be securely fastened to blackboard trim or grounds or directly to wall in accordance with the manufacturer's instructions.

The rail may be mortised or rabbeted in any position on the face of the trim or may be screwed to the surface. The rail should be mortised in a groove to attain the most attractive appearance. A mortised rail blends into the ensemble so completely as to be very inconspicuous. See the optional positions in small drawing.

The sections of the rail are self-aligning, through the use of the dovetail joint, thus assuring the smooth passage of the hooks and clips. Being firmly fastened with screws, the rail cannot pull loose.

It is extremely versatile in its use: the two different hooks provide for the display or hanging of anything from a sheet of paper to a map case weighing 100 lbs.

Locks, Combination
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Locks, Key
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Loose Leaf Books & Systems
Remington Rand Inc., 369-375

Machines, Milling, Grinding, etc.
Brown & Sharpe Mfg. Co., 526, 527

Magnifiers
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Manual Training Equipment
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Brown & Sharpe Mfg. Co., 526, 527
Delta Mfg. Co., 529
Duro Metal Products Co., 586
New Britain Machine Co., 537
Oliver Machinery Co., 530
Peck, Stow & Wilcox Co., 532
South Bend Lathe Works, 531
Stanley Electric Tool Div., Stanley Works, 520
Stanley Tools, 521
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Map Rail
Andrew Hoffman, 594

Mats, Filter
Eaton-Dikeman Co., 497

Mats, Gymnasium
American Playground Device Co., 284, 285
Everwear Mfg. Co., 283

Matting, Rubber
American Playground Device Co., 284, 285
American Tile & Rubber Co., 63
J. I. Holcomb Mfg. Co., 188, 189
Servicised Products Corp., 65

Mattresses
Doehler Metal Furniture Co., Inc., 437-440

Meat Choppers
John E. Smith's Sons Co., 457

Medals, Bronze
General Bronze Corp., 136

Memorial Plates
General Bronze Corp., 136
James H. Matthews & Co., 150

Menu Boards
Tablet & Ticket Co., 464

Metal Spinning Lathes
Oliver Machinery Co., 530

Metal Trim
Milcor Steel Company, 94, 95

Metal Weather Strips
Accurate Metal Weather Strip Co., 137
Athey Co., 138, 139

Meters, Electric
General Electric Co., 116; 273; 320; 499-502
General Radio Co., 503
Rawson Electrical Instrument Co., 504
Weston Electrical Instrument Corp., 121; 505

Meters, Steam Condensation
American District Steam Co., 90

Micrometers
Brown & Sharpe Mfg. Co., 526, 527

Micro-Projectors
Bausch & Lomb Optical Co., 325; 495

Microscopes & Accessories
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Milling Machines
Brown & Sharpe Mfg. Co., 526, 527

Mills, Coffee & Spice
Hobart Mfg. Co., 456

Mills, Jar
F. J. Stokes Machine Co., 498
United States Stoneware Co., 494

Mitre Boxes
Stanley Tools, 521

Mixers, Food
Hobart Mfg. Co., 456

Mixers, Laboratory
F. J. Stokes Machine Co., 498

Monuments, Bronze
General Bronze Corp., 136

Mops
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189

Mortisers
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Oliver Machinery Co., 530
Yates-American Machine Co., 524, 525

Motion Picture Cameras (see Cameras, Motion Picture)

Motion Picture Films (see Films)

Motion Picture Projectors (see Projectors, 16 mm. and Projectors, 35 mm.)

Motion Picture Screens
Da-Lite Screen Co., Inc., 327
I. Weiss and Sons Inc., 341

Motion Pictures
Erpi Classroom Films Inc., 315-319
General Electric Co., 116; 273; 320; 499-502

Motor Generator Sets
General Electric Co., 116; 273; 320; 499-502

Motors
General Electric Co., 116; 273; 320; 499-502
Graybar Electric Co., 333

Moulding
Wood Conversion Co., 84

Mouldings, Metal
Wooster Products Inc., 72

Music Reproduction Systems
RCA Mfg. Co., Inc., 329-332
Western Electric Co., 334, 335

Name Plates, Desk
Tablet & Ticket Co., 464

Nosing & Edging, Metal
Wooster Products Inc., 72

Nursery Stock
Cole Nursery Co., 219
Stumpp & Walter Co., 218

Office Equipment
Art Metal Construction Co., 359-368
Diebold Safe & Lock Co., 379
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Yawman and Erbe Mfg. Co., 376

Office Machines
Burroughs Adding Machine Co., 401-404
Dictaphone Sales Corp., 394, 395
Ediphone, 396, 397
Remington Rand Inc., 369-375
L. C. Smith & Corona Typewriters, Inc., 400
Underwood Elliott Fisher Co., 398, 399

Optical Measuring Instruments
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Organic Chemicals (see Chemicals)

Oscillators
General Radio Co., 503

Oscillographs
RCA Mfg. Co., Inc., 329-332

Ovens, Electric
Edison General Electric Appliance Co., 451

Ovens, Gas
G. S. Blodgett Co., Inc., 447
Carbide and Carbon Chemicals Corp., 449
Standard Gas Equipment Corp., 452

Padlocks
Eagle Lock Co., 406
National Lock Co., 407
Yale & Towne Mfg. Co., 408

Paints & Varnishes
Asphalt Products Co., Inc., 184
Hillyard Sales Co., 186, 187
A. C. Horn Co., 605
United Laboratories, Inc., 200, 201

Paneling
F. E. Berry Jr. & Co., Inc., 601-604
Celotex Corp., 77-81
Wood Conversion Co., 84

Panels, Card Index
Diebold Safe & Lock Co., 379

Panels, Control
General Electric Co., 116; 273; 320; 499-502

Panels, Key
P. O. Moore, Inc., 153-155

Panels, Laboratory
Cincinnati Time Recorder Co., 124
General Electric Co., 116; 273; 320; 499-502
International Business Machines Corp., 122, 123
Standard Electric Time Co., 125

Paper Cutters
American Type Founders, 533-536

Paper, Laboratory Lining
Eaton-Dikeman Co., 497

Papers, Filter
Eaton-Dikeman Co., 497

Partitions
Alberene Stone Corp. of Va., 490
Art Metal Construction Co., 359-368
Bolger-Heller Slate Co., 146
Celotex Corp., 77-81
Structural Slate Co., 145

Partitions, Rolling
Kinnear Mfg. Co., 135

Partitions, Wire
Stewart Iron Works Co., 233

Peelers, Vegetable
Hobart Mfg. Co., 456

Perennials
Stumpp & Walter Co., 218

Phonograph Equipment
RCA Mfg. Co., Inc., 329-332

Photoelectric Units
General Electric Co., 116; 273; 320; 499-502
Weston Electrical Instrument Corp., 121; 505

Photographic Lenses
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Photomicrographic Equipment
Bausch & Lomb Optical Co., 325; 495
Spencer Lens Co., 326; 496

Physics, Apparatus for
General Electric Co., 116; 273; 320; 499-502
General Radio Co., 503
Rawson Electrical Instrument Co., 504
Western Electrical Instrument Corp., 121; 505

Piano Casters
Bassick Co., 338, 444

Pipe Cleaners
Allan J. Coleman, 202

Pipe, Waste & Drainage (see Drainage Pipe)

Pipe & Fittings
Crane Co., 106
Republic Steel Corp., 91; 448
Revere Copper & Brass Inc., 93

Pipe & Fittings, Acid Resisting
General Ceramics Co., 491
Maurice A. Knight, 492
Pacific Foundry Co., Ltd., 493
United States Stoneware Co., 494

Pipe Covering
Ric-Wil Co., 96
Ruberoid Co., 87

Planers
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Oliver Machinery Co., 530
Stanley Tools, 521
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Planfiles
Art Metal Construction Co., 359-368

Plaques, Wall
General Bronze Corp., 136
James H. Matthews & Co., 150

Plastic Ware, Lighting
Chase Brass & Copper Co., Inc., 114, 115
F. W. Wakefield Brass Co., 119

Plants, Bulbs, Seeds, etc.
Stumpp & Walter Co., 218

Playground Apparatus
American Playground Device Co., 284, 285
Anchor Post Fence Co., 228
Bradley Washfountain Co., 107
Everwear Mfg. Co., 283
Fred Medart Manufacturing Co., 276; 392
Mitchell Mfg. Co., 286
Recreation Equipment Co., 287

Playground Surfacing
Socony-Vacuum Oil Co., Inc., 227
Texas Co., 89
United Laboratories, Inc., 200, 201

Plumbing & Plumbing Brass Goods
Crane Co., 106
Speakman Co., 104, 105

Portable Bleachers
Universal Bleacher Co., 278

Portable Chairs (see Chairs, Folding & Portable)

Portable Screens
Da-Lite Screen Co., Inc., 327

Portable Sound Systems
RCA Mfg. Co., Inc., 329-332

Portable Typewriters
Remington Rand Inc., 369-375
L. C. Smith & Corona Typewriters, Inc., 400
Underwood Elliott Fisher Co., 398, 399

Portable Vacuum Cleaners, Heavy Duty
Invincible Vacuum Cleaner Mfg. Co., 198
Spencer Turbine Co., 199
B. F. Sturtevant Co., 99

Power Lawn Mowers
Coldwell Lawn Mower Co., 221
Gravely Manufacturing Co., 220
Jacobsen Mfg. Co., 222
Moto-Mower Co., 223
Toro Manufacturing Co., 224
Whirlwind Lawn Mowers Sales Corp., 225

Practice Equipment for Teaching Filing, etc.
Remington Rand Inc., 369-375
Yawman and Erbe Mfg. Co., 376

Preserves
John Sexton & Co., 463

Presses, Drill
Boice-Crane Co., 528
Delta Mfg. Co., 529
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Presses, Printing
American Type Founders, 533-536

Primer Typewriters
Remington Rand Inc., 369-375
L. C. Smith & Corona Typewriters, Inc., 400

Printing Supplies & Equipment
American Type Founders, 533-536

Projector Stands
Da-Lite Screen Co., Inc., 327

Projectors, 16 mm.
Ampro Corp., 321
Bell & Howell Co., 322
DeVry Corp., 323
RCA Mfg. Co., Inc., 329-332
Victor Animatograph Corp., 324

Projectors, 35 mm.
DeVry Corp., 323
RCA Mfg. Co., Inc., 329-332

Projectors, Still
Bausch & Lomb Optical Co., 325; 495
Capitol Stage Lighting Co., 339
DeVry Corp., 323
RCA Mfg. Co., Inc., 329-332
Spencer Lens Co., 326; 496
Victor Animatograph Corp., 324

Proprietary Fire Alarm Systems
Gamewell Co., 130, 131

Public Address Systems
Graybar Electric Co., 333
International Business Machines Corp., 122, 123
RCA Mfg. Co., Inc., 329-332
Standard Electric Time Co., 125
Western Electric Co. (Distributed by Graybar Elec. Co.), 334, 335

Public Address Systems, Portable
RCA Mfg. Co., Inc., 329-332

Pumps, Centrifugal
Nash Engineering Co., 97

Pumps, Hand
Allan J. Coleman, 202

Pumps, Vacuum & Pressure
Nash Engineering Co., 97
F. J. Stokes Machine Co., 556

Push Button Boards
Cincinnati Time Recorder Co., 124

Racks, Gymnasium Basket, Steel
All-Steel-Equip Co., Inc., 377
Durabilt Steel Locker Co., 380, 381
Lyon Metal Products, Inc., 386, 387
Worley & Co., 393

Racks, Steel (for Checkrooms)
General Fireproofing Co., 382, 383; 486, 487
Lyon Metal Products, Inc., 386, 387

Radiator Valves, Thermostatic
American District Steam Co., 90
Powers Regulator Co., 100, 101

Radio Equipment—Ultra High Frequency
RCA Mfg. Co., Inc., 329-332

Radio Laboratory Equipment
General Radio Co., 503
RCA Mfg. Co., Inc., 329-332

Radios
Graybar Electric Co., 333
RCA Mfg. Co., Inc., 329-332

Rail, Display & Map
Andrew Hoffman, 594

Railings, Wrought Iron
Stewart Iron Works Co., 233

Ranges, Electric
Edison General Electric Appliance Co., 451

Ranges, Gas
Carbide and Carbon Chemicals Corp., 449
Standard Gas Equipment Corp., 452

Reading Aids
American Optical Co., 328

Record Systems
Art Metal Construction Co., 359-368
Diebold Safe & Lock Co., 379
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Remington Rand Inc., 369-375
Yawman and Erbe Mfg. Co., 376

Recording Equipment, Voice
RCA Mfg. Co., Inc., 329-332

Records, Looseleaf
Remington Rand Inc., 369-375

Records, Phonograph
RCA Mfg. Co., Inc., 329-332

Refinishing Machines, Desk & Blackboard
A. C. Horn Co., 605

Reflectors, Lighting
Benjamin Electric Mfg. Co., 270, 271
Crouse-Hinds, 272
General Electric Co., 116; 273; 320; 499-502

Refrigeration Brines
Columbia Alkali Corp., 226
Solvay Sales Corp., 282

Refrigerators
Westinghouse Electric & Mfg. Co., 120; 274; 453

Regulators, Temperature
Powers Regulator Co., 100, 101
Warren Webster & Co., 103

Relays, Photoelectric
General Electric Co., 116; 273; 320; 499-502
Weston Electrical Instrument Corp., 121; 505

Ribbons, Typewriter (see Typewriter Supplies)

Road Surfacing Materials (see Surfacing Materials, Road)

Rollers, Grass
Moto-Mower Co., 223
Toro Manufacturing Co., 224

Rollers, Window Shade
E. I. du Pont de Nemours & Co., Inc., 608, 609
Stewart Hartshorn Co., 141

Roof Arches, Long Span
Lamella Roof Syndicate, Inc., 88

Roof Coatings
Barrett Co., 85
A. C. Horn Co., 605
Ruberoid Co., 87
Texas Co., 89
United Laboratories, Inc., 200, 201

Roof Construction
Lamella Roof Syndicate, Inc., 88
Republic Steel Corp., 91; 448

Roof Deck, Steel
Milcor Steel Company, 94, 95

Roofing
Barrett Co., 85
Bolger-Heller Slate Co., 146
Philip Carey Co., Inc., 86
Celotex Corp., 77-81
Johns-Manville, 82, 83
Ruberoid Co., 87
Servicised Products Corp., 65
Texas Co., 89
United Laboratories, Inc., 200, 201

Rubber Flooring
American Tile & Rubber Co., 63
Goodyear Tire and Rubber Co., Inc., 64
Servicised Products Corp., 65
Wright Rubber Products Co., 68

Rubbish Disposal (see Incinerators)

Runners, Rubber Corridor
American Playground Device Co., 284, 285

Safes
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Diebold Safe & Lock Co., 379
General Fireproofing Co., 382, 383; 486, 487
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Yawman and Erbe Mfg. Co., 376

Safety Glass for Buses
American Window Glass Co., 553

Safety Stair Treads
Alberene Stone Corp. of Va., 490
American Abrasive Metals Co., 71
American Mason Safety Tread Co., 70
Bolger-Heller Slate Co., 146
A. C. Horn Co., 605
Servicised Products Corp., 65
Structural Slate Co., 145
Wooster Products Inc., 72

Sanders, Belt
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Yates-American Machine Co., 524, 525

Sanders, Drum & Disc
American Saw Mill Machinery Co., 519
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Yates-American Machine Co., 524, 525

Sanders, Floor
Hillyard Sales Co., 186, 187
Lincoln-Schlueter Floor Machinery Co., Inc., 196

Sanders, Portable Disc
Lincoln-Schlueter Floor Machinery Co., Inc., 196

Sanders, Portable Electric
Oliver Machinery Co., 530

Saws, Band, Circular, Scroll, etc.
Boice-Crane Co., 528
Delta Mfg. Co., 529
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Saws, Electric Hand
Oliver Machinery Co., 530

Scenery, Stage
I. Weiss and Sons, Inc., 341

School Buses
Bender Body Co., 551
International Harvester Co., 552

School Records & Forms (see Filing Systems)

Score Boards, Electric
Fair-Play Co., 275
General Electric Co., 116; 273; 320; 499-502

Scrapbaskets
Globe Wernicke Co., 384, 385

Screens, Motion Picture
Da-Lite Screen Co., Inc., 327
I. Weiss and Sons, Inc., 341

Scrubbing Machines, Electric
General Floorcraft, Inc., 195
Hillyard Sales Co., 186, 187
Lincoln-Schlueter Floor Machinery Co., Inc., 196
Midland Chemical Laboratories, Inc., 192-194
G. H. Tennant Co., 197

Seals, Embossed
Tablet & Ticket Co., 464

Seating, Grandstand
Heywood-Wakefield Co., 336
Universal Bleacher Co., 278

Secretaries
General Fireproofing Co., 382, 383; 486, 487

Sectional Card Cases
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385

Seeds, Grass & Garden
Stumpp & Walter Co., 218

Settees, Iron & Wire
Stewart Iron Works Co., 233

Sewage Ejectors
Nash Engineering Co., 97

Sewer Cleaners
Allan J. Coleman, 202

Shades, Window
Athey Co., 138, 139
Columbus Coated Fabrics Corp., 140
E. I. du Pont de Nemours & Co., Inc., 608, 609
Stewart Hartshorn Co., 141

Shapers
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Delta Mfg. Co., 529
Oliver Machinery Co., 530
Stanley Electric Tools Div., Stanley Works, 520
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Shears, Portable Electric
Stanley Electric Tool Div., Stanley Works, 520

Sheet Metal Working Equipment
Oliver Machinery Co., 530
Peck, Stow & Wilcox Co., 532

Shelving, Library (Wood)
Globe-Wernicke Co., 384, 385

Shelving, Steel
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Excel Metal Cabinet Co., Inc., 427-433
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Lyon Metal Products, Inc., 386, 387
Fred Medart Manufacturing Co., 276; 392
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
Worley & Co., 393
Yawman and Erbe Mfg. Co., 376

Shelving, Stoneware
Alberene Stone Corp. of Va., 490

Shingles, Asbestos, Asphalt, etc.
Philip Carey Co., Inc., 86
Johns-Manville, 82, 83
Ruberoid Co., 87

Shop Equipment
All-Steel-Equip Co., Inc., 377
American Saw Mill Machinery Co., 519
American Type Founders, 533-536
Boice-Crane Co., 528
Brown & Sharpe Mfg. Co., 526, 527
Delta Mfg. Co., 529
Duro Metal Products Co., 586
Lyon Metal Products, Inc., 386, 387
Oliver Machinery Co., 530
Peck, Stow & Wilcox Co., 532
South Bend Lathe Works, 531
Stanley Electric Tool Div., Stanley Works, 520
Stanley Tools, 521
Walker-Turner Co., Inc., 522, 523
Wickes Bros., 538
Worley & Co., 393
Yates-American Machine Co., 524, 525

Shower Baths
Bradley Washfountain Co., 107

Shower Compartments, Stone
Alberene Stone Corp. of Va., 490

Shower Fittings
Crane Co., 106
Speakman Co., 104, 105

Shower Mixers, Safety
Powers Regulator Co., 100, 101

Showers, Playground
Bradley Washfountain Co., 107

Shrubs
Stumpp & Walter Co., 218

Shutters, Fire
Kinnear Mfg. Co., 135

Sickle Mowers
Gravely Manufacturing Co., 220
Moto-Mower Co., 223
Toro Mfg. Co., 224

Signs, Exit
Tablet & Ticket Co., 464

Signs, Restaurant & Cafeteria
Tablet & Ticket Co., 464

Sinks, Kitchen
Excel Metal Cabinet Co., Inc., 427-433

Sinks, Laboratory
Alberene Stone Corp. of Va., 490
General Ceramics Co., 491
Kewaunee Mfg. Co., 488
Maurice A. Knight, 492
Laboratory Furniture Co., 489
United States Stoneware Co., 494

Sinks, Wash
Bradley Washfountain Co., 107
Crane Co., 106

Skylights
Milcor Steel Company, 94, 95
Revere Copper & Brass Inc., 93

Slate Blackboard
Bolger-Heller Slate Co., 146
Natural Slate Blackboard Co., 144

Slate Roofing
Bolger-Heller Slate Co., 146

Slicing Machines
Hobart Mfg. Co., 456
John E. Smith's Sons Co., 457

Slides, Playground
American Playground Device Co., 284, 285
Anchor Post Fence Co., 228
Everwear Mfg. Co., 283
Fred Medart Manufacturing Co., 276; 392
Mitchell Mfg. Co., 286
Recreation Equipment Co., 287

Slides, Stereopticon
Victor Animatograph Corp., 324

Snow Plows
Gravely Manufacturing Co., 220
Moto-Mower Co., 223
Toro Manufacturing Corp., 224

Soap Dispensers
Hillyard Sales Co., 186, 187

Soap, Liquid
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191

Soaps
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
A. C. Horn Co., 605
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191

Soapstone
Alberene Stone Corp. of Va., 490

Sound Deadening Materials
F. E. Berry, Jr. & Co., Inc., 601-604
Celotex Corp., 77-81
Johns-Manville, 82, 83

Sound Motion Picture Equipment—16 mm.
Ampro Corp., 321
Bell & Howell Co., 322
DeVry Corp., 323
Erpi Classroom Films, Inc., 315-319
RCA Mfg. Co., Inc., 329-332
Victor Animatograph Corp., 324

Sound Motion Picture Equipment—35 mm.
DeVry Corp., 323
Erpi Classroom Films, Inc., 315-319
RCA Mfg. Co., Inc., 329-332

Speakers
DeVry Corp., 323
Graybar Electric Co., 333

Speech Recording Equipment
RCA Mfg. Co., Inc., 329-332

Spectroscopes
Bausch & Lomb Optical Co., 325; 495

Spices
John Sexton & Co., 463

Sports Buildings
Lamella Roof Syndicate, Inc., 88

Sports Timing Equipment
Fair-Play Co., 275
Warren Telechron Co., 126

Spotlights
Capitol Stage Lighting Co., 339
I. Weiss and Sons, Inc., 341

Sprayer, Cleaning Solution
J. I. Holcomb Mfg. Co., 188, 189

Sprayers, Tree & Shrub
Moto-Mower Co., 223

Sprinkler Alarm Systems
American District Telegraph Co., 128, 129

Sprinkler Systems, Fire
Rockwood Sprinkler Co., 132

Stadium Repairing, Concrete
United Laboratories, Inc., 200, 201

Stadiums (see Grandstands)

Stage Equipment, Electrical
I. Weiss and Sons, Inc., 341

Stage Equipment (Rigging & Hardware)
J. R. Clancy Inc., 340
I. Weiss and Sons, Inc., 341

Stage Lighting Apparatus & Supplies
Capitol Stage Lighting Co., 339
Graybar Electric Co., 333
I. Weiss and Sons, Inc., 341

Stage Scenery
I. Weiss and Sons, Inc., 341

Stainless Steel
Crucible Steel Co. of America, 452a, 452b
Albert Pick Co., Inc., 460
Republic Steel Corp., 91; 448
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Stair Treads
Alberene Stone Corp. of Va., 490
American Abrasive Metals Co., 71
American Mason Safety Tread Co., 70
American Tile & Rubber Co., 63
Bolger-Heller Slate Co., 146
A. C. Horn Co., 605
National Fireproofing Corp., 76
National Terrazzo & Mosaic Assn., 74, 75
Servicised Products Corp., 65
Structural Slate Co., 145
Wooster Products Inc., 72

Stair Treads, Resurfacing
United Laboratories, Inc., 200, 201

Steam Cookers
Cleveland Range Co., 450

Steam Main
American District Steam Co., 90
Ric-Wil Co., 96

Steel Cabinets & Lockers
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Diebold Safe & Lock Co., 379
Doehler Metal Furniture Co., Inc., 437-440
Durabilt Steel Locker Co., 380, 381
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Lyon Metal Products, Inc., 386, 387
Fred Medart Manufacturing Co., 276; 392
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Worley & Co., 393

Steel Flagpoles (see Flagpoles)

Steel Grandstands (see Grandstands)

Steel Roof Deck
Milcor Steel Company, 94, 95
Truscon Steel Co., 97-104

Steel Stadiums (see Grandstands)

Stereopticons
Bausch & Lomb Optical Co., 325; 495
Capitol Stage Lighting Co., 339
DeVry Corp., 323
Spencer Lens Co., 326; 496
Victor Animatograph Corp., 324

Stone, Architectural
Alberene Stone Corp. of Va., 490
Bolger-Heller Slate Co., 146
Structural Slate Co., 145

Stoneware, Acid Resisting
Alberene Stone Corp. of Va., 490
General Ceramics Co., 491
Maurice A. Knight, 492
Laboratory Furniture Co., 489
United States Stoneware Co., 494

Stools
General Fireproofing Co., 382, 383; 486, 487
Kewaunee Mfg. Co., 488

Storage Batteries
Thomas A. Edison, Inc., 506
Electric Storage Battery Co., 133; 507

Structural Slate
Bolger-Heller Slate Co., 146
Structural Slate Co., 145

Student Records
Art Metal Construction Co., 359-368
Remington Rand Inc., 369-375

Sub-Floors
Johns-Manville, 82, 83
Thos. Moulding Floor Mfg. Co., 62

Suction Pumps & Cups
Allan J. Coleman, 202

Sumps & Catch Basins, Acid Resisting
Alberene Stone Corp. of Va., 490
General Ceramics Co., 491
Maurice A. Knight, 492
United States Stoneware Co., 494

Surfacers
American Saw Mill Machinery Co., 519
Oliver Machinery Co., 530
Stanley Tools, 521
Walker-Turner Co., 522, 523
Yates-American Machine Co., 524, 525

Surfacing Materials, Road
Socony-Vacuum Oil Co., Inc., 227
Texas Co., 89
United Laboratories, Inc., 200, 201

Swimming Pool Equipment
American Playground Device Co., 284, 285
Anchor Post Fence Co., 228
Bradley Washfountain Co., 107
Crane Co., 106
Everwear Mfg. Co., 283
Fred Medart Manufacturing Co., 276; 392
Mitchell Mfg. Co., 286
Recreation Equipment Co., 287
Speakman Co., 104, 105
Spencer Turbine Co., 199

Swimming Pool Lighting (see Underwater Lighting)

Swimming Pool Paints & Surfacing
United Laboratories, Inc., 200, 201

Swimming Pool Sanitation Systems
Mathieson Alkali Works, 279
Pennsylvania Salt Mfg. Co., 280
Wallace & Tiernan Co., Inc., 281

Swimming Pools, All-Steel
Pittsburgh-Des Moines Steel Co., 277

Swings
American Playground Device Co., 284, 285
Anchor Post Fence Co., 228
Everwear Mfg. Co., 283
Fred Medart Manufacturing Co., 276; 392
Mitchell Mfg. Co., 286
Recreation Equipment Co., 287

Switchboards
General Electric Co., 116; 273; 320; 499-502

Systems, Loose Leaf
Remington Rand Inc., 369-375

Table Tennis Tables
Durabilt Steel Locker Co., 380, 381

Tables
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Doehler Metal Furniture Co., Inc., 437-440
Excel Metal Cabinet Co., Inc., 427-433
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Kewaunee Mfg. Co., 488
Theodor Kundtz Co., 337
Laboratory Furniture Co., 489
Metal Office Furniture Co., 388, 389
Mitchell Mfg. Co., 286
Mutschler Brothers Co., 436
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391
L. & J. G. Stickley, Inc., 441

Tables & Table Tops, Cafeteria
General Fireproofing Co., 382, 383; 486, 487
Kewaunee Mfg. Co., 488
Mutschler Brothers Co., 436
Albert Pick Co., Inc., 460
Republic Steel Corp., 91; 448
Nathan Straus-Duparquet, Inc., 461
John Van Range Co., 462

Tables & Table Tops, Laboratory
Alberene Stone Corp. of Va., 490
General Fireproofing Co., 382, 383; 486, 487
Kewaunee Mfg. Co., 488
Laboratory Furniture Co., 489
Structural Slate Co., 145

Tablet Machines
F. J. Stokes Machine Co., 498

Tablets, Aluminum & Bronze
General Bronze Corp., 136
James H. Matthews & Co., 150
Stewart Iron Works Co., 233

Talking Motion Pictures
Bell & Howell Co., 322
Erpi Classroom Films, Inc., 315-319

Talking Picture Equipment
Ampro Corp., 321
Bell & Howell Co., 322
DeVry Corp. 323
RCA Mfg. Co., Inc., 329-332

Tanks, Acid & Chemical Resisting
Alberene Stone Corp. of Va., 490
General Ceramics Co., 491
Kewaunee Mfg. Co., 488
Maurice A. Knight, 492
Laboratory Furniture Co., 489
United States Stoneware Co., 494

Tea
John Sexton & Co., 463

Teaching Films
Bell & Howell Co., 322
Erpi Classroom Films Inc., 315-319
General Electric Co., 116; 273; 320; 499-502

Telephone Systems
Cincinnati Time Recorder Co., 124
Graybar Electric Co., 333
International Business Machines Corp., 122, 123
Standard Electric Time Co. 125

Telescopes
Bausch & Lomb Optical Co., 325; 495

Temperature Regulation
Powers Regulator Co., 100, 101
Warren Webster & Co., 103

Tennis Court Backstops
Anchor Post Fence Co., 228
Cyclone Fence Co., 231
W. F. Robertson Steel & Iron Co., 232
Stewart Iron Works Co., 233
Wickwire Spencer Steel Co., 234

Tennis Court Enclosures (see Fencing)

Tennis Court Surfacing
Socony-Vacuum Oil Co., Inc., 227
United Laboratories, Inc., 200, 201

Tennis Court Treatment
Columbia Alkali Corp., 226
Socony-Vacuum Oil Co., Inc., 227
Solvay Sales Corp., 282

Tennis Nets, Wire
American Playground Device Co., 284, 285
Anchor Post Fence Co., 228

Terrazzo
National Terrazzo & Mosaic Assn., 74, 75

Textbook Bindings
E. I. du Pont de Nemours & Co., Inc., 608, 609

Textbooks
Dictaphone Corp., 394, 395

Thermocouples
General Radio Co., 503
Rawson Electrical Instrument Co., 504

Thermometers, Dial
Powers Regulator Co., 100, 101

Thermostats
Powers Regulator Co., 100, 101

Thru-Wall Flashing
Revere Copper & Brass Inc., 93

Tile, Acoustical
F. E. Berry, Jr. & Co., Inc., 601-604
Celotex Corp., 77-81
Johns-Manville, 82, 83

Tile Cleaner
J. B. Ford Co., 185; 459
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
A. C. Horn Co., 605
Midland Chemical Laboratories, Inc., 192-194

Tile, Cork-Rubber
Servicised Products Corp., 65

Tile, Drain Foundation
Ric-Wil Co., 96

Tile Flooring (see Flooring)

Tile, Rubber
American Tile & Rubber Co., 63
Goodyear Tire & Rubber Co., Inc., 64
Wright Rubber Products Co., 68

Tile, Structural
National Fireproofing Corp., 76

Tile, Wall
Mosaic Tile Co., 73
Wood Conversion Co., 84

Time Recorders
Cincinnati Time Recorder Co., 124

Timers, Electric
Fair-Play Co., 275
International Business Machines Corp., 122, 123
Warren Telechron Co., 126

Toilet Partitions
Alberene Stone Corp. of Va., 490

Tool Cribs
General Fireproofing Co., 382, 383; 486, 487
Lyon Metal Products, Inc., 386, 387

Tool Sets, Student
Brown & Sharpe Mfg. Co., 526, 527

Tools & Cutters, Shop
Brown & Sharpe Mfg. Co., 526, 527
New Britain Machine Co., 537
Stanley Tools, 521

Tools, Electric
Stanley Electric Tool Div., Stanley Works, 520

Tools, Sheet Metal Working
Peck, Stow & Wilcox Co., 532

Transfer Cases, Steel
All-Steel-Equip Co., Inc., 377

Transformers
General Electric Co., 116; 273; 320; 499-502

Traps, Acid-Proof
United States Stoneware Co., 494

Traps, Steam & Radiator
American District Steam Co., 90
Powers Regulator Co., 100, 101

Trays, Serving
Aluminum Cooking Utensil Co., 454
Chelsea Products, 458
John Van Range Co., 462

Treads, Safety, Stair
Alberene Stone Corp. of Va., 490
American Abrasive Metals Co., 71
American Mason Safety Tread Co., 70
A. C. Horn Co., 605
Servicised Products Corp., 65
Structural Slate Co., 145
Wooster Products Inc., 72

Treads, Safety Stair, Resurfacing
United Laboratories, Inc., 200, 201

Troughs, Blackboard Crayon
Milcor Steel Company, 94, 95

Troughs, Laboratory Table
Maurice A. Knight, 492

Tubs, Stoneware, Acid-Resisting
Alberene Stone Corp. of Va., 490
General Ceramics Co., 491
Maurice A. Knight, 492
Laboratory Furniture Co., 489
United States Stoneware Co., 494

Type, Printing
American Type Founders, 533-536

Typewriter Supplies
Miller-Bryant-Pierce Co., 342
Remington Rand Inc., 369-375
L. C. Smith & Corona Typewriters, Inc., 400
Underwood Elliott Fisher Co., 398, 399

Typewriters
Remington Rand Inc., 369-375
L. C. Smith & Corona Typewriters, Inc., 400
Underwood Elliott Fisher Co., 398, 399

Underwater Lighting
Holophane Co., Inc., 117
Westinghouse Electric & Mfg. Co., 120; 274; 453

Unit Ventilation
John J. Nesbitt, Inc., 98
B. F. Sturtevant Co., 99

Urinals
Crane Co., 106

Vacuum Cleaners, Portable
Invincible Vacuum Cleaner Mfg. Co., 198
Spencer Turbine Co., 199

Vacuum Cleaning Systems
Spencer Turbine Co., 199
B. F. Sturtevant Co., 99

Vacuum Driers & Evaporators
F. J. Stokes Machine Co., 498

Vacuum Pumps & Compressors
F. J. Stokes Machine Co., 498

Vacuum Tubes
General Electric Co., 116; 273; 320; 499-502

Valves, Flush
Crane Co., 106
Speakman Co., 104, 105

Valves, Radiator
American District Steam Co., 90
Powers Regulator Co., 100, 101

Varnishes
American Crayon Co., 183
Hillyard Sales Co., 186, 187
United Laboratories, Inc., 200, 201

Veneers
Celotex Corp., 77-81

Venetian Blinds
Athey Co., 138, 139

Ventilating Pipe & Fittings
General Ceramics Co., 491
Maurice A. Knight, 492
Pacific Foundry Co., Ltd., 493
Republic Steel Corp., 91; 448
United States Stoneware Co., 494

Ventilating Units
John J. Nesbitt Inc., 98
B. F. Sturtevant Co., 99

Ventilators, Roof
W. F. Hirschman Co., Inc., 102
Milcor Steel Company, 94, 95

Visible Record Forms and Equipment
Art Metal Construction Co., 359-368
Diebold Safe & Lock Co., 379
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Remington Rand Inc., 369-375

Voltmeters (see Meters, Electric)

Wainscoting
Alberene Stone Corp. of Va., 490
Bolger-Heller Slate Co., 146
Congoleum-Nairn Inc., 60, 61
Mosaic Tile Co., 73
Thos. Moulding Floor Mfg. Co., 62
National Fireproofing Corp., 76
Structural Slate Co., 145
Tile-Tex Co., 56-59
Wood Conversion Co., 84
Wright Rubber Products Co., 68

Wallboard
Wood Conversion Co., 84

Wall-Covering, Cork Composition
Congoleum-Nairn Inc., 60, 61

Wall-Covering, Rubber
American Tile & Rubber Co., 63
Goodyear Tire & Rubber Co., Inc., 64

Wall Panels, Asbestos-Cement
Ruberoid Co., 87

Wall Tile
Mosaic Tile Co., 73
National Fireproofing Corp., 76
Tile-Tex Co., 56-59

Wardrobes, Steel
All-Steel-Equip Co., Inc., 377
Art Metal Construction Co., 359-368
Berger Mfg. Co., 378
Diebold Safe & Lock Co., 379
Doehler Metal Furniture Co., Inc., 437-440
Durabilt Steel Locker Co., 380, 381
General Fireproofing Co., 382, 383; 486, 487
Globe-Wernicke Co., 384, 385
Lyon Metal Products, Inc., 386, 387
Fred Medart Manufacturing Co., 276; 392
Metal Office Furniture Co., 388, 389
Remington Rand Inc., 369-375
Security Steel Equipment Corp., 390, 391

Washers, Blueprint
Wickes Bros., 538

Washroom Equipment
Bradley Washfountain Co., 107
Crane Co., 106
J. I. Holcomb Mfg. Co., 188, 189
Midland Chemical Laboratories, Inc., 192-194
Speakman Co., 104, 105

Waste Disposal (see Incinerators)

Watchman Supervising Systems
American District Telegraph Co., 128, 129

Watercloset Cleaners, Wire
Allan J. Coleman, 202

Waterclosets
Crane Co., 106

Water Coolers
Westinghouse Electric Mfg. Co., 120; 274; 453

Water Heaters
American District Steam Co., 90

Waterproofing
Asphalt Products Co., Inc., 184
Barrett Co., 85
Philip Carey Co., Inc., 86
A. C. Horn Co., 605
Servicised Products Corp., 65
United Laboratories, Inc., 200, 201

Water Purification
Mathieson Alkali Works, 279
Pennsylvania Salt Mfg. Co., 280
Wallace & Tiernan Co., Inc., 281

Water Softener
J. B. Ford Co., 185; 459
Midland Chemical Laboratories, Inc., 192-194

Water Stills
F. J. Stokes Machine Co., 498

Wattmeters (see Meters, Electric)

Waxes, Floor
American Crayon Co., 183
General Floorcraft, Inc., 195
Hillyard Sales Co., 186, 187
J. I. Holcomb Mfg. Co., 188, 189
A. C. Horn Co., 605
Midland Chemical Laboratories, Inc., 192-194
Selig Co., 190, 191
United Laboratories, Inc., 200, 201

Waxing Machines, Electric
General Floorcraft, Inc., 195
Hillyard Sales Co., 186, 187
Lincoln-Schlueter Floor Machinery Co., Inc., 196
Midland Chemical Laboratories, Inc., 192-194
G. H. Tennant Co., 197

Weather Stripping
Accurate Metal Weather Strip Co., 137
Athey Co., 138, 139
A. C. Horn Co., 605

Wheel-filing Equipment
Diebold Safe & Lock Co., 379

Window Guards, Iron & Wire
Cyclone Fence Co., 231
Stewart Iron Works Co., 233

Window Shades
Athey Co., 138, 139
Columbus Coated Fabrics Corp., 140
E. I. du Pont de Nemours & Co., Inc., 608, 609
Stewart Hartshorn Co., 141

Windows, Casement
General Bronze Corp., 136

Windows, Double Hung
General Bronze Corp., 136

Windows, Horizontally Pivoted
General Bronze Corp., 136

Wire Work, Ornamental
Stewart Iron Works Co., 233

Wiring Supplies
Graybar Electric Co., 333

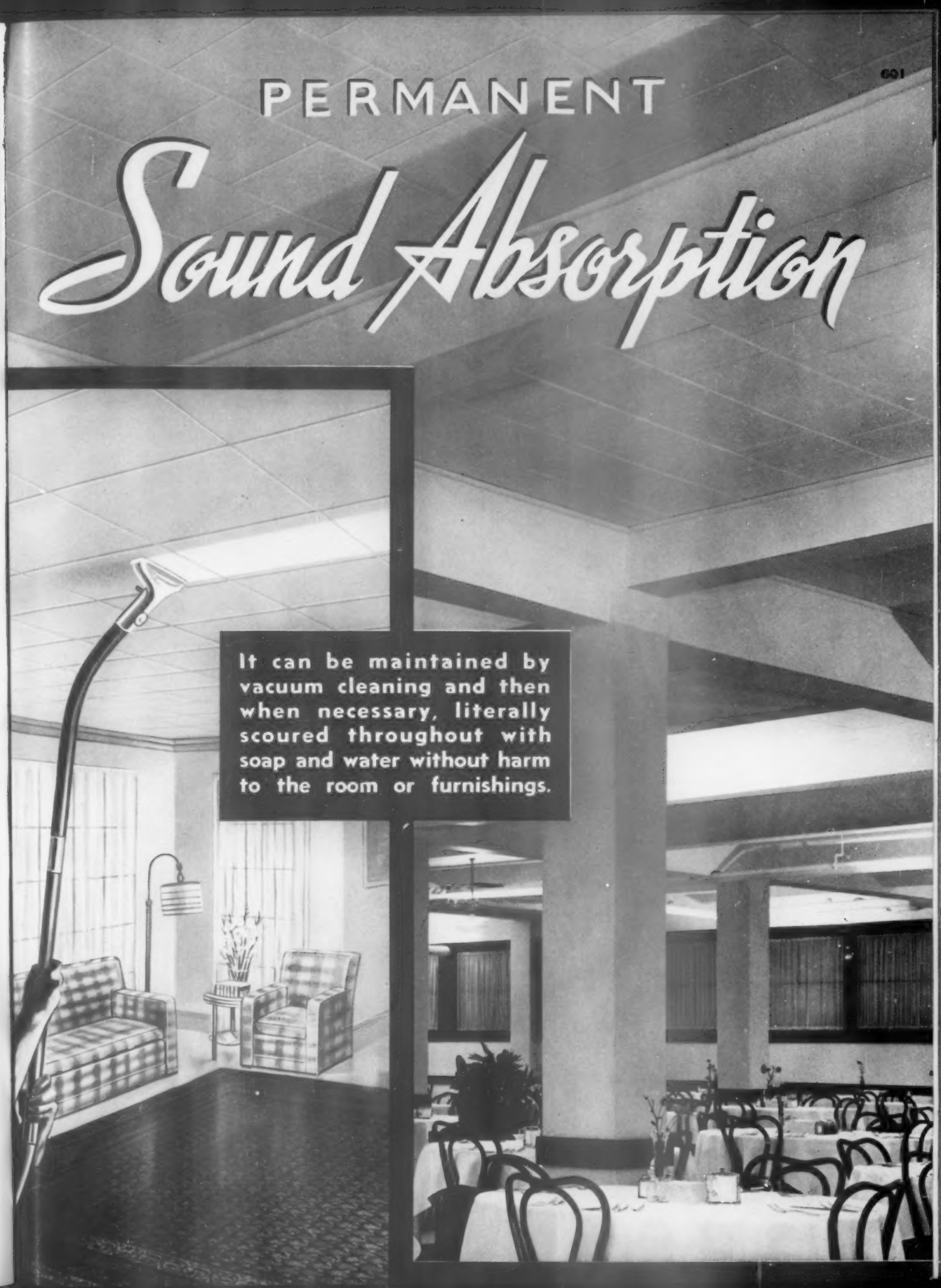
Wood Block Flooring
Jennison-Wright Co., 66, 67
Maple Flooring Mfrs. Assn., 69

Woodworking Machinery
American Saw Mill Machinery Co., 519
Boice-Crane Co., 528
Delta Mfg. Co., 529
Duro Metal Products Co., 586
Oliver Machinery Co., 530
South Bend Lathe Works, 531
Walker-Turner Co., Inc., 522, 523
Yates-American Machine Co., 524, 525

Work-Benches
Lyon Metal Products, Inc., 386, 387
New Britain Machine Co., 537
Oliver Machinery Co., 530
Worley & Co., 393

Wrenches
New Britain Machine Co., 537

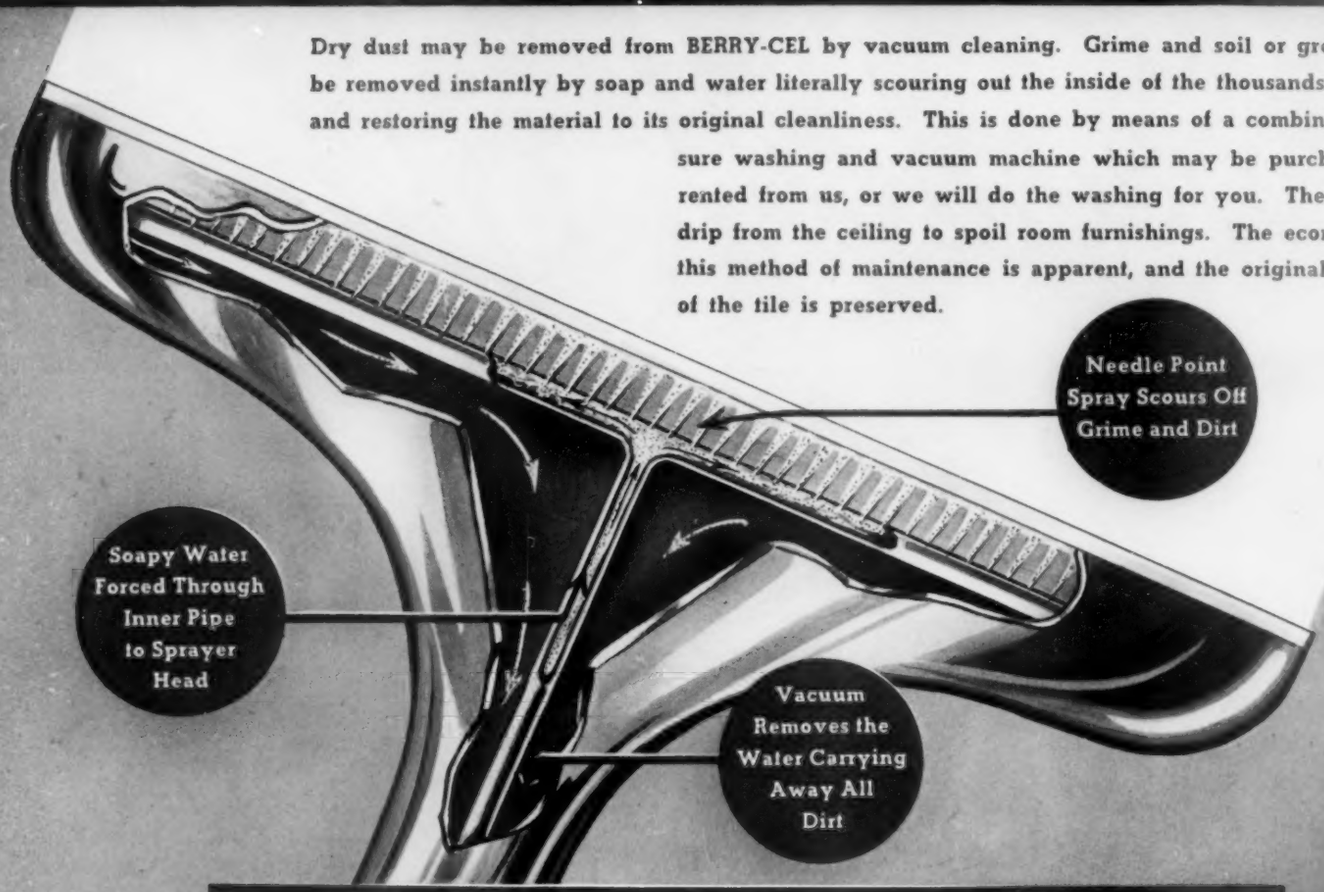
PERMANENT
Sound Absorption



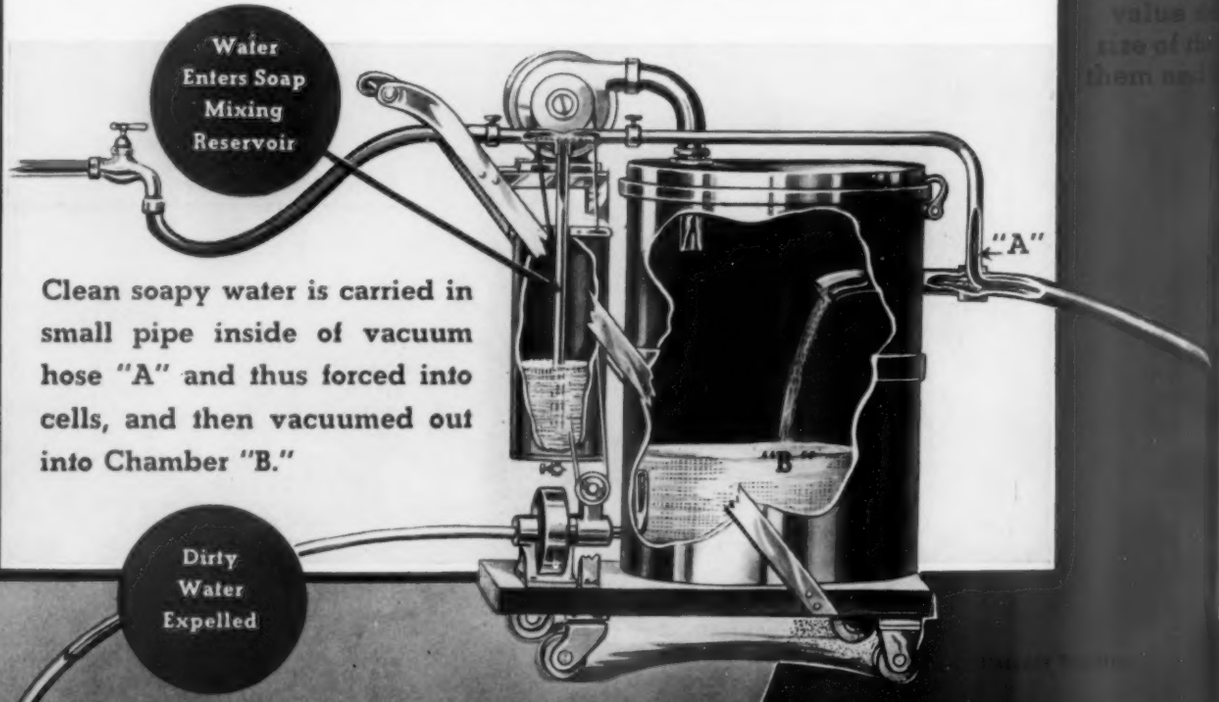
It can be maintained by vacuum cleaning and then when necessary, literally scoured throughout with soap and water without harm to the room or furnishings.

BERRY-CEL Washable

Dry dust may be removed from BERRY-CEL by vacuum cleaning. Grime and soil or grease can be removed instantly by soap and water literally scouring out the inside of the thousands of cells and restoring the material to its original cleanliness. This is done by means of a combined pressure washing and vacuum machine which may be purchased or rented from us, or we will do the washing for you. There is no drip from the ceiling to spoil room furnishings. The economy of this method of maintenance is apparent, and the original surface of the tile is preserved.


Needle Point Spray Scours Off Grime and Dirt
Soapy Water Forced Through Inner Pipe to Sprayer Head
Vacuum Removes the Water Carrying Away All Dirt

With this special appliance soapy water of any desired degree of scouring strength is forced to circulate by means of controlled air-pressure throughout the entire thickness of the material, forcing out all soil and grime from each individual intercommunicating air cell to the surface. Simultaneously, this device operates as a vacuum cleaner, draining the expelled dirty water as it sprays clean water. The appliance is so efficient that it is not necessary to protect furniture, merchandise, etc., immediately below it, all possibility of dripping being eliminated.



Clean soapy water is carried in small pipe inside of vacuum hose "A" and thus forced into cells, and then vacuumed out into Chamber "B."

Fire-Proof · Paint-Proof

BERRY-CEL, BEING MINERAL, SUFFERS NO HARM FROM SOAP AND WATER, AND CAN BE SO CLEANED whenever needed and as often as required for the life of the building with practical economy.

The BERRY-CEL washing machine that this Company has perfected not only washes the SURFACE of BERRY-CEL but sprays soap and water into the material (cells) under pressure. Then, under vacuum the water (and accumulated dirt) is sucked out. Furthermore, the material can then be rinsed with clear water and vacuumed again (and again if necessary) till it is hygienically clean. This can be done on ceilings or on walls without mess or fuss, that is, without harming other surfaces in the room, or mussing up the furnishings. In other words the vacuum cleaner in reverse—for the ceiling in lieu of the floor, not alone subtracting loose dirt, but rinsing and cleaning every cell, literally "scrubbing them out" (under air pressure).

Every physician knows, and acknowledges the great value of plain soap and water in hygienic situations. They know it to be a magnificent detergent. BERRY-CEL gives them the foundation requisite—cleanliness.

It is perfectly feasible, if desired, to use a disinfectant or germicide in cleaning BERRY-CEL. It is believed that this factor of cleanliness commends BERRY-CEL, not alone to hospitals, but to every home, office or auditorium in the country where sanitary conditions are desired as part of the installation.

It requires no skilled labor, nor any particular skill or training to handle this washing machine. All that is necessary is to put soap and water into the tank, plug into an electric source of motive power and then move the head over the ceiling as is done with a vacuum cleaner on the floor.

SOUND ABSORPTION

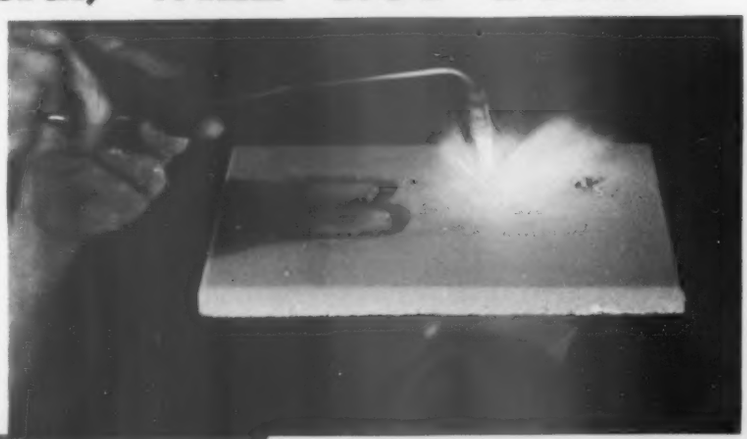
BERRY-CEL will absorb more than 90% @ 512 cycles per second. It can be made with almost any sound absorbing coefficient, low, medium or high. This is because the degree of intercommunication between the cells and thickness of the slab can be varied.

BERRY-CEL (mineral) WILL NOT BURN!

The ceiling, to all fire-fighters, is a dangerous place. Anything **combustible** there adds to the fire risk. Non-combustible material, on the contrary, is a positive additional safety feature.

A high insulating value on a ceiling, protects the floor above, or the roof above, from fire breaking through.

These are important qualities to fire insurance companies and others concerned with the hazards of fire.



Cutting initials B-C with an oxy-acetylene blowtorch into tile held on bare hand, showing tremendous heat insulating value of BERRY-CEL.

• BERRY-CEL •
ABSORBS SOUND PERMANENTLY

You are now offered the lowest priced fireproof, paintproof, washable acoustical material on the market. In addition, it can be maintained at a lower cost than any other sound absorbing material.

FIREPROOF—BERRY-CEL is made of powdered limestone aerated, and is therefore absolutely incombustible. It is entirely mineral—there is nothing vegetable or organic in it.

PAINTPROOF—Anyone can brush or spray paint it with any kind of paint, any number of coats, any number of times without reducing its sound absorbing value, simply by pin-pricking the film of paint.

WATERPROOF—It can actually be boiled in water without harm.

WASHABLE—It can be maintained by vacuum cleaning and then, when necessary, literally scoured throughout with soap and water, all without harm to the room or furnishings by means of the combination spray and vacuum method.

SOUND ABSORPTION—BERRY-CEL can absorb more than **90%** @ 512 cycles per second. It can be made with almost any sound absorbing value desired, low, medium, or high. National Bureau of Standards test figures are available.

APPEARANCE—Textured surface is similar to a fine sand finished plaster. The natural color is white with a very high light reflection value 73%-79%. BERRY-CEL can be had in any color desired, the colors integrally mixed throughout the material and not just applied on the surface. It can be decorated in any manner desired without reducing sound absorbing value, simply by pin-pricking the film of paint.

ERECTION—BERRY-CEL can be cemented to any surface, but better still, it can be attached mechanically to any type of construction thus eliminating lath and plaster. This method of attachment permits the acoustical tiles to be taken down and replaced at will. This permits access at any point to ventilating ducts, conduits or pipes which may be run in the air space above the tiles. It should be noted that all four sides of the tile are sealed against the passage of air.

SALVAGABLE—BERRY-CEL when erected on furring is 100% salvagable. Thus, the tiles can quickly be taken down and then erected at any other desired location.

LOW COST—The cost installed is less than any other fireproof, paintproof, washable acoustical material on the market. As it is mineral and thus fireproof, it eliminates lath and plaster.

GUARANTEE—We have been installing acoustical material for 19 years and now we manufacture it. Therefore, we offer you a complete acoustical engineering, installing service with **undivided responsibility.**

ENGINEERING SERVICE—We will gladly prepare an analysis of any sound problem you may have, entirely without charge or obligation.

SAMPLES OF BERRY-CEL IN VARIOUS COLORS WILL BE PROMPTLY FURNISHED YOU UPON REQUEST.

Manufactured by

F. E. Berry Jr. & Co., Inc.

EVERETT, MASSACHUSETTS
(A Boston Suburb)

Acoustical and Soundproofing **SOUND** *Engineers and Constructors*

These postcards are supplied for your convenience in securing catalogs or quotations without charge or obligation to you.

•

All requests will receive prompt attention.

The American School and University

Catalog Service Dept.

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

30B

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

30B

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

30B

I should like to receive catalogs and price lists on the following products:--

.....

.....

.....

.....

Name.....

Title.....

City.....State.....

30B

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT No. 280 Sec. 384½ P. L. & R., NEW YORK, N. Y.

The American School & University,
470 Fourth Avenue,
New York, N. Y.

These postcards are supplied for your convenience in securing catalogs or quotations without charge or obligation to you.

•

All requests will receive prompt attention.

The American School and University

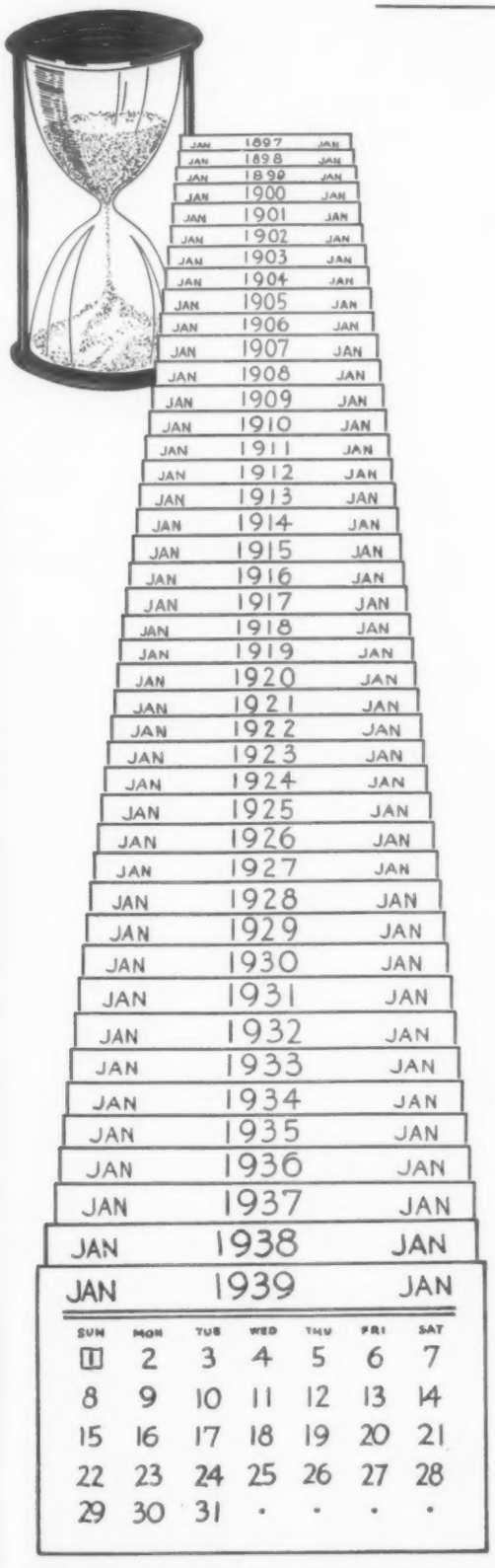
Catalog Service Dept.

A. C. HORN COMPANY

Established 1897

Manufacturers of Materials for Building Maintenance and Construction

43-36 Tenth Street, Long Island City, New York



42 YEARS

Pride of Craftsmanship

Yes . . . 42 years is a long time to keep a promise. Yet, 42 years ago we decided that only the finest raw materials, thorough inspection and accurate manufacturing would enter into Horn Maintenance Materials. This pledge to ourselves and to those whom we serve . . . never has been broken and never will be.

Experience

For 42 years schools and colleges have used Horn products in steadily increasing volume.

The experience of our Engineering Department and Field Representatives is at your disposal.

Why not consult us in connection with your requirements for:

Paints — **Varnishes**
Enamels — **Lacquers**
Floor Treatments — **Waterproofings**
Roofing Materials
Caulking, Pointing and Glazing Compounds

Index to Advertisers

A

Accurate Metal Weather Strip Co. 137
Alberene Stone Corporation of Virginia 490
All-Steel-Equip Company, Inc. 377
Aluminum Cooking Utensil Company, The 454
American Abrasive Metals Co. 71
American Crayon Company, The 183
American District Steam Company 90
American District Telegraph Company 128, 129
American Mason Safety Tread Co. 70
American Optical Company 328
American Playground Device Co. 284, 285
American Saw Mill Machinery Co. 519
American Tile & Rubber Co. 63
American Type Founders 533–536
American Window Glass Company 553
Ampro Corporation 321
Anchor Post Fence Company 228
Art Metal Construction Company 359–368
Asphalt Products Co., Inc. 184
Athey Company 138, 139

B

Barrett Company, The 85
Bassick Company, The 338; 444
Bausch & Lomb Optical Company 325; 495
Bell & Howell Company 322
Bender Body Company, The 551
Benjamin Electric Mfg. Co. 270, 271
Berger Manufacturing Division, Republic Steel Corporation 378
F. E. Berry Jr. & Co., Inc. 601–604
Blodgett Co., Inc., The G. S. 447
Blue Ridge Glass Corporation 142, 143
Boice-Crane Company 528
Bolger-Heller Slate Co. 146
Bradley Washfountain Co. 107
Brown & Sharpe Mfg. Co. 526, 527
Buckeye Glide Company, Inc. 445
Burroughs Adding Machine Company 401–404

C

Capitol Stage Lighting Co. 339
Carbide and Carbon Chemicals Corporation, Pyrofax Division 449
Carey Company, The Philip 86
Celotex Corporation, The 77–81
Chase Brass & Copper Co. 114, 115
Chelsea Products 458
Cincinnati Time Recorder Company, The 124
Clancy, Inc., J. R. 340
Cleveland Range Co., The 450
Coldwell Lawn Mower Company 221
Cole Nursery Company, The 219
Coleman, Allan J. 202
Columbia Alkali Corporation, The 226
Columbus Coated Fabrics Corporation 140
Congoleum-Nairn, Inc. 60, 61
Continental Steel Corporation 229
Copperweld Steel Company 230
Cornell Iron Works, Inc. 134
Corning Glass Works 110–113; 455
Crane Co. 106
Crouse-Hinds 272
Crucible Steel Co. of America 452a, 452b
Cyclone Fence Company 231

D

Da-Lite Screen Co., Inc. 327
Delta Manufacturing Company 529
DeVry Corporation 323
Dictaphone Corporation 394, 395
Diebold Safe & Lock Co. 379
Ditto, Incorporated 405
Doehler Metal Furniture Co., Inc. 437–440
du Pont de Nemours & Co., Inc., E. I. "Fabrikoid" Division 608, 609
Durabilt Steel Locker Co. 380, 381
Duro Metal Products Co. 586

E

Eagle Lock Co. 406
Eaton-Dikeman Company, The 497
Ediphone, The—Thomas A. Edison, Inc. 396, 397
Edison General Electric Appliance Company, Inc. 451
Edison Storage Battery, Division of Thomas A. Edison, Inc. 506
Electric Storage Battery Company, The 133; 507
Erpi Classroom Films, Inc. 315–319
Everwear Manufacturing Company, The 283
Excel Metal Cabinet Co., Inc. 427–433

F

Fair-Play Company, The 275
Faultless Caster Corporation 446
Ford Company, The J. B. 185; 459

G

Gamewell Company, The 130, 131
General Bronze Corporation 136
General Ceramics Company 491
General Electric Company 116; 273; 320; 499–502
General Fireproofing Company, The, 382, 383; 486, 487
General Floorcraft, Inc. 195
General Radio Company 503
Gleason-Tiebout Glass Co. 118
Globe-Wernicke Co., The 384, 385
Goodyear Tire & Rubber Company, Inc., The 64
Gravely Manufacturing Company 220
Graybar Electric Company 333

H

Hartshorn Company, Stewart 141
Heywood-Wakefield Company 336
Hillyard Sales Company, The 186, 187
Hirschman Co., Inc., W. F. 102
Hoffman, Andrew 594
Hobart Manufacturing Co., The 456
Holcomb Mfg. Company, J. I. 188, 189
Holophane Company, Inc. 117
Horn Company, A. C. 605

I

International Business Machines Corp. 122, 123
International Harvester Company (Incorporated) 552
Invincible Vacuum Cleaner Mfg. Co. 198

J

Jacobsen Manufacturing Co. 222
Jennison-Wright Company, The 66, 67
Johns-Manville 82, 83

K

Kerner Incinerator Company 109
Kewaunee Manufacturing Company 488
Kinnear Manufacturing Co., The 135

Knight, Maurice A. ... 492
Kundtz Co., The Theodor ... 337

L

Laboratory Furniture Co., Inc. ... 489
Lamella Roof Syndicate, Inc. ... 88
Lincoln-Schlueter Floor-Machinery Company, Inc. 196
Lingo & Son, Inc., John E. ... 152
Lloyd-Thomas Co., The ... 179–182
Lyon Metal Products, Incorporated ... 386, 387

M

Maple Flooring Manufacturers Association ... 69
Mathieson Alkali Works (Inc.), The ... 279
Matthews & Co., Jas. H. ... 150
Medart Manufacturing Co., Fred ... 276; 392
Metal Office Furniture Company ... 388, 389
Miami Cabinet Division, The Philip Carey Company ... 442, 443
Midland Chemical Laboratories, Inc. ... 192–194
Milcor Steel Company ... 94, 95
Miller-Bryant-Pierce Company, The ... 342
Mitchell Manufacturing Co. ... 286
Moore, Inc., P. O. ... 153–155
Mosaic Tile Company, The ... 73
Moto-Mower Company, The ... 223
Moulding Floor Mfg. Co., Thos. ... 62
Mutschler Brothers Company ... 436

N

Nash Engineering Company, The ... 97
National Fireproofing Corporation ... 76
National Lock Co. ... 407
National Terrazzo and Mosaic Association, The 74, 75
Natural Slate Blackboard Co. ... 144
Nesbitt, Inc., John J. ... 98
New Britain Machine Co., The ... 537
New York Silicate Book Slate Co., Inc. ... 147
Norton Door Closer Company ... 148
Norton Lasier Company ... 149

O

Oliver Machinery Company ... 530

P

Pacific Foundry Company, Ltd. ... 493
Peck, Stow & Wilcox Company, The ... 532
Pennsylvania Salt Manufacturing Co. ... 280
Pick Co., Inc., Albert ... 460
Pittsburgh-Des Moines Steel Company ... 277
Powers Regulator Company, The ... 100, 101

R

Rawson Electrical Instrument Co. (Incorporated) 504
RCA Manufacturing Company, Inc. ... 329–332
Recreation Equipment Co. ... 287
Remington Rand Inc. ... 369–375
Republic Steel Corporation ... 91; 448
Revere Copper & Brass Incorporated ... 93
Ric-Wil Company, The ... 96
Robertson Steel & Iron Company, W. F. ... 232
Rockwood Sprinkler Company ... 132
Ruberoid Co., The ... 87

S

St. Charles Manufacturing Co. ... 434, 435
Security Steel Equipment Corporation ... 390, 391
Selig Company, The ... 190, 191
Servicised Products Corporation ... 65
Sexton & Co., John ... 463
Smith's Sons Company, John E. ... 457
Smith & Corona Typewriters, Inc., L. C. Smith ... 400
Socony-Vacuum Oil Company, Inc., Standard Oil of New York Division ... 227
Solvay Sales Corporation ... 282
South Bend Lathe Works ... 531
Speakman Company ... 104, 105
Spencer Lens Company ... 326; 496
Spencer Turbine Company, The ... 199
Standard Electric Time Company, The ... 125
Standard Gas Equipment Corporation ... 452
Stanley & Patterson ... 92
Stanley Works, The
Stanley Electric Tool Division ... 520
Stanley Tools ... 521
Stewart Iron Works Company, The ... 233
Stickley, Inc., L. & J. G. ... 441
Stokes Machine Company, F. J. ... 498
Straus-Duparquet, Inc., Nathan ... 461
Structural Slate Company, The ... 145
Stumpp & Walter Co. ... 218
Sturtevant Company, B. F. ... 99

T

Tablet & Ticket Co., The ... 464
Taylor Co., The Halsey W. ... 108
Tennant Company, G. H. ... 197
Texas Company, The ... 89
Thomas-Smith Company, The ... 127
Tile-Tex Company, The ... 56–59
Toro Manufacturing Corporation ... 224
Traffic & Street Sign Company ... 151

U

Underwood Elliott Fisher Company ... 398, 399
United Laboratories, Incorporated ... 200, 201
United States Stoneware Co., The ... 494
Universal Bleacher Co. ... 278

V

Van Range Co., The John ... 462
Victor Animatograph Corporation ... 324

W

Wakefield Brass Company, The F. W. ... 119
Walker-Turner Co., Inc. ... 522, 523
Wallace & Tiernan Company, Inc. ... 281
Warren Telechron Company ... 126
Warren Webster & Company ... 103
Weiss and Sons, Inc., I. ... 341
Western Electric Company ... 334, 335
Westinghouse Electric and Mfg. Co.
Commercial Refrigeration ... 453
Lighting Division ... 120; 274
Weston Electrical Instrument Corp. ... 121; 505
Whirlwind Lawn Mowers Sales Corp. ... 225
Wickes Brothers ... 538
Wickwire Spencer Steel Company ... 234
Wood Conversion Company ... 84
Wooster Products Inc. ... 72
Worley & Co. ... 393
Wright Rubber Products Co. ... 68

Y

Yale & Towne Mfg. Co., The ... 408
Yates-American Machine Company ... 524, 525
Yawman and Erbe Mfg. Co. ... 376

DIRTY HANDS

WON'T SOIL THESE BOOKS!

They're bound in

DU PONT "FABRIKOID"* OR PX CLOTH

WHAT a life a school book leads! Dropped, knocked around, thumbed over by the most careless (and often dirtiest) thumbs in the world. Well, du Pont makes PX Cloth and "Fabrikoid" binding materials that are not only extra-tough but *washable*, too!

The great number of widely used texts now bound in PX Cloth or "Fabrikoid" is proof of extreme ruggedness and serviceability. School boards consistently specify that either PX Cloth or "Fabrikoid" be used. They want bindings that will *wash!* They *know* that handsome PX Cloth and "Fabrikoid" materials *resist book-devouring vermin.*

When dealing with du Pont you have several advantages: rapid service in providing samples; wide choice of colors, quickly available; prompt delivery; uniform high quality.

We welcome your inquiries. May we help remedy your binding problems?

**"Fabrikoid" is du Pont's trade mark designating its pyroxylin coated and impregnated fabric.*

DU PONT
REG. U.S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., INC.
"FABRIKOID" DIVISION
NEWBURGH, N. Y.

"Contemporary Economic Problems and Trends"—Harcourt, Brace and Company. *"Plays and the Theater"*—Little, Brown and Company. *Problems and Values of Today"*—Little, Brown and Company. *"How to Organize and Conduct a Meeting"*—Noble and Noble Publishers Inc.

You get **MORE** *light*

without glare with washable

"TONTINE"* SHADES

WHO SAYS SO? Laboratory tests say so!

Actual tests *prove* that "Tontine" shades let in from 73% to 140% *more* light than ordinary painted cloth shades. And since "Tontine" shades are *washable*, they *keep* this greater translucency. A little soap and water make them as fresh and clean as new. They're color-fast, too!

"Tontine" shades are amazingly durable! They won't crack, fray, or pinhole! They're tough and flexible! And they save money, because "Tontine" shades last much longer.

Leading universities, private and public schools are now using "Tontine" shades. May we help you get *more* natural light for your classrooms? Write for samples.

**"Tontine" is du Pont's trade mark for its pyroxylin impregnated washable window shade cloth.*

DU PONT
REG. U.S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., INC., "FABRIKOID" DIVISION, NEWBURGH, NEW YORK